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THE EXTERNAL STRUCTURE OF SOME THYSANOPTEROUS LARVAE

By E. R. SPEYER, M.A., and W. J. PARR.

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WITH FORTY-EIGHT TEXT-FIGURES.

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I. INTRODUCTION.

AN examination of some Thysanopterous larvae belonging to the Sub-Order Terebrantia, principally of species injurious to plants grown in glasshouses, has provided material for the publication of some descriptions and illustrations which may assist entomologists to identify larval forms which come to their notice.

After hatching from the egg, which is inserted into the tissues of the host-plant by the female imago, the larva passes through only two instars before reaching the prepupal stage at the second ecdysis. Priesner, in his *Monograph of European Thysanoptera* (1928), gives detailed and very accurate descriptions of the larvae of many species, accompanied by keys for their convenient separation. It is not always, however, easy or possible to determine from these descriptions what characteristics are of true diagnostic value, and they are accompanied by very few illustrations. In his general descriptions, the disposition of the spiracles and setae does not always coincide with that found during the present investigation.

From the material which has been collected, the following general conclusions appear to be applicable to larvae of Terebrantia :—

1. The 1st instar larvae of all forms possess characteristics in common by which they may be distinguished from any larva in the 2nd instar. These characters concern the chaetotaxy (see Section VI).
2. The principal diagnostic characteristics which serve to separate 1st instar larvae of different forms from one another are not always applicable to 2nd instar larvae, and vice versa.
3. There is often greater structural similarity between larvae of different species, when their corresponding instars are compared, than there is between the two instars of one and the same species.

The various species of which it has been possible to obtain material are here listed under the Sub-Families to which they belong, following in the main Priesner's (1926-28) classification :—

AEOLOTHRIPIDAE.

AEOLOTHRIPINAE—*Aeolothrips fasciatus* L.

THRIPIDAE.

HELIOTHRIPINAE—*Heliothrips haemorrhoidalis* Bouché; *Hercinothrips femoralis* Reuter; *Parthenothrips dracaenae* Heeger.

CHIROTHRIPINAE—*Limothrips cerealium* Haliday; *Aptinothrips rufus* (Gmelin) Haliday; *Aptinothrips stylifer* Trybom.

SERICOTHRIPINAE—*Scirtothrips longipennis* Bagnall; *Dendrothrips degeeri* Uzel; *Anaphothrips obscurus* Müller.

Incertae sedis—*Chaetanaphothrips* sp.; *Scolothrips sexmaculatus* Pergande.

THRIPINAE—*Frankliniella intonsa* Trybom; *Kakothrips pisivorus* Westwood; *Taeniothrips picipes* Zetterstedt; *Taeniothrips vulgatissimus* Haliday; *Taeniothrips atratus* Haliday; *Taeniothrips inconsequens* Uzel; *Thrips physapus* L.; *Thrips validus* Uzel; *Thrips angusticeps* Uzel; *Thrips viminalis* Uzel; *Thrips fuscipennis* Haliday; *Thrips major* Uzel; *Thrips sambuci* Uzel; *Thrips flavus* Schrank; *Thrips nigropilosus* Uzel; *Thrips tabaci* Lindeman.

Priesner (1928) has transferred species of the genus *Chaetanaphothrips* to *Anaphothrips*, and thus to the sub-family SERICOTHRIPINAE. The imago of the undetermined species listed above is related to, but quite distinct from, *Chaet. orchidii* Moulton. The larvae both of the latter insect and of the predatory *Scolothrips sexmaculatus* show little, if any, relationship either with those of SERICOTHRIPINAE or of THRIPINAE, and for the sake of convenience the two insects are here treated as of uncertain position.

Kakothrips pisivorus Westw. is the specific name now adopted by British authors for *K. robustus* Uzel, and *Taeniothrips picipes* Zett. holds priority over *T. primulae* Haliday.

Ae. fasciatus is a common inhabitant of flowering plants, and is predatory upon Aphids and other Thysanoptera.

Scol. sexmaculatus is predatory upon Red Spider-mite; the only specimen—a 2nd instar larva—available for study was obtained from California.

Species of the Heliothripine genera, with *Scirt. longipennis* and *Chaetanaphothrips*, are found upon hothouse plants and are of tropical or sub-tropical origin. *Dendrothrips* breeds upon the foliage of broad-leaved trees.

The CHIROTIRIPINAE and *Anaph. obscurus* are common inhabitants of grasses and cereal crops, and amongst the former, *Lim. cerealium*, the "Grain Thrips" is known to cause "blindness" in oats.

Kak. pisivorus is a serious pest of cultivated peas and beans, and has once been recorded from flowers of cyclamen grown under glass: it is known as the "Pea Thrips."

Frank. intonsa is common in flowers of wild plants, and breeds in those of *Orchis mascula*.

Taen. picipes is found in flowers of primrose and other wild plants.

Taen. inconsequens, the "Pear Thrips," is well known as being destructive to the flower-buds of fruit-trees.

Taen. vulgatissimus and *atratus* are injurious to the flowers of garden plants, especially to those of carnation.

Of the species listed under the genus *Thrips*, *T. physapus* and *T. validus* are almost universally abundant in flowers of dandelion. *T. angusticeps* has been recorded as a pest of cabbage and lettuce.

T. fuscipennis, the "Rose Thrips," is responsible for the deformation of rose blooms, and occasionally causes injury to the foliage of cucumber and to the fruit of strawberry. The allied species *T. sambuci* on elder, *T. viminalis* on willow, and *T. major*, universally common upon flowering shrubs, are especially included, as their female imagines can only be separated upon slight structural differences, whereas their 2nd instar larvae are readily distinguishable from one another and from those of *T. fuscipennis*.

T. flavus breeds in flowers of gorse (*Ulex*) and *T. nigropilosus*—a rare species in England—is a serious pest of chrysanthemum on the continent.

T. tabaci, the "Onion Thrips," is possibly the most widely distributed, and the most injurious of all Thysanoptera. It is a vector of the virus disease "Spotted Wilt," and also causes widespread injury to the flowers of valuable glasshouse plants such as carnation, chrysanthemum, cyclamen, arum, to the foliage of cucumber, and occasionally to the fruit of tomato.

II. PREPARATION OF SPECIMENS FOR MICROSCOPIC EXAMINATION.

For a detailed examination of the integumental structure it is necessary to employ the oil-immersion lens, but characteristics of diagnostic value can be made out with a magnification of some 350 diameters. Canada balsam and allied mountants are not suitable for the elucidation of the larval structure. Faure's Medium, which has been proved best, and superior to Berlese's Fluid, for this special purpose, is made up as follows: gum arabic (acacia) 30 gr., chloral hydrate 50 gr., glycerine 20 c.c., distilled water 50 c.c. The gum arabic is dissolved in the water and filtered, and the chloral hydrate and glycerine are respectively added to the filtrate.

For quick examination, larvae may be mounted directly in the medium, but such hastily made preparations are liable to subsequent deterioration, though the specimens may be reconditioned even after long keeping.

The best preparations have been obtained by first preserving larvae in alcohol 40 c.c., glycerine 16 c.c. and distilled water 44 c.c., and mounting direct from this preservative.

It is often, however, necessary to clear specimens, in which case these are removed from the preservative and kept in alcohol 40 c.c., potassium hydroxide 5 c.c. and water 55 c.c. for a period of from 12 to 24 hours, after which they are replaced in the preservative and afterwards mounted.

When removing from one solution to another or to the mountant, it is advisable to use a fine brush, and not a glass pipette, to the sides of which the specimens are liable to adhere.

In remounting specimens previously mounted in xylol-soluble media, these should be brought down to 70% alcohol, in the usual manner, and kept in the preservative fluid for some hours before transference to Faure's Medium.

Crumpled or deteriorated larvae previously mounted in Faure's Medium are reconditioned by washing out the mountant in distilled water, immersing in 5% potassium hydroxide for several hours, and then in distilled water for a similar period, and transferring to 16% glycerine solution before final mounting in Faure's Medium.

Treatment with 5% potassium hydroxide may remove pigment from the eyes and chromatophores, but does not adversely affect those structures which are of value as diagnostic characters. Immersion of specimens in dilute glycerine or glycerine and alcohol prior to clearing in potassium hydroxide appears to lessen greatly the risk of subsequent crumpling in the mountant.

The larvae are best mounted upon a moderately thick cover-glass measuring $2'' \times \frac{3}{4}''$ and covered with a thin cover-slip (about $\frac{1}{2}''$ square), so that they can be examined both dorsally and ventrally under high magnification.

III. GENERAL STRUCTURE OF THE LARVA.

The larva resembles the imago in the general formation of the head and of the asymmetrical mouth-parts which are enclosed in a tubular mouth-cone situated between the maxillae and extending in the mid-ventral line sometimes as far as the coxal region of the mesothorax. Similar also in both is the position of the forwardly directed antennae, which arise from the anterior portion of the head, and of the three pairs of legs.

The number of abdominal segments is eleven, as in the imago, but these and the three free thoracic segments are more cylindrical in shape. The integument is weakly sclerotised; that of the head smooth and devoid of reticulation: sclerites of the thoracic and abdominal segments so characteristic of the imagines are wanting. The antennae and legs differ very considerably in structure from those of the imago, while the laterally placed eyes are not of the compound type and ocelli are never present.

There are usually, but not always, three pairs of spiracles, situated respectively upon the mesothorax, 2nd and 8th abdominal segments, as compared with four pairs in the imago, respectively upon the meso- and metathorax, the 1st and 8th abdominal segments. The structure of the faceted peritremes of the spiracles appears to be somewhat similar in both. Certain insignificant structures are common to larvae and imagines, namely, a circular sensorium situated distally upon the upper surface of the 2nd antennal joint and a pair of pori upon the dorsal surface of each of the 9th and 10th abdominal segments. These pori, sometimes known as "seta-pits," have no relation either structurally or positionally to setae. Some 2nd instar larvae possess a pair of pori also upon the 8th abdominal segment, while in the imagines two pairs are usually present upon the majority of abdominal segments and they occur also upon the thorax.

The larval chaetotaxy bears little, if any, resemblance to that of the imago. The arrangement of setae upon the larval body is of particular interest and conforms to a strict bilateral symmetry: the number of pairs of setae upon each body division is comparatively small, and displays a remarkable uniformity amongst the different forms of larvae. In some larvae setae may show a high

degree of structural specialisation, which is seldom, if ever, correlated with similar modification in the imago. The chaetotaxy of the two larval instars is never similar, and they may always be separated from one another by characteristics which are similarly applicable at least throughout the Sub-Order Terebrantia.

(a) *Dimensions and Colour.*

On hatching from the egg, the 1st instar larva measures from 0.25 mm. to 0.5 mm. in length; the head is abnormally large in comparison with the rest of the body and in ventral aspect may be extended posteriorly as far as the coxal region of the mesothorax. Through rapid growth of the thorax and abdomen, the proportions are soon reversed, so that the mouth-cone reaches at most to the coxal region of the prothorax.

Variability in the dimensions of 1st instar larvae when ready for the ecdysis precludes the separation of the two instars from one another by measurement.

According roughly to the size of the future imago, the full-grown 2nd instar larva has a length of about 0.8 mm. to nearly 2 mm.

The general colour is usually white or yellow, but an orange or red pigment suffuses the body of a number of forms not necessarily related to one another systematically. The pigment is contained in chromatophores situated in the hypodermis, and is either generally diffused (cf. 2nd instar of *Scirtothrips* and *Chaetanaphothrips*) or confined to more definite stripes and bands upon the thoracic and first eight abdominal segments (cf. *Thrips validus*); pigmented areas have a reticular appearance. Development of yellow or red pigment is capricious within the species (cf. *Taeniothrips picipes* Zett.) and is greater in 2nd than in 1st instar larvae. The pigment of the eyes is light red in the first, and orange or dark red in the second instar. Grey or brownish-yellow coloration of varying intensity is imparted to the integument in definite areas upon the head and antennae, the thoracic, and the more posterior abdominal segments in many forms, and to a lesser extent to the femora and tibiae of the legs. These areas are due to sclerotisation, under which heading they are referred to in greater detail, for they are of great diagnostic value. The alveoli of the dorsal setae upon the thoracic and abdominal segments are sometimes surrounded by grey circles (*Aeolothrips* 1st instar and *Scirtothrips* 2nd instar).

Rarely (*Kakothrips*) the integument of the 9th and 10th abdominal segments may be more strongly sclerotised to a yellowish-brown or dark brown colour, and this occurs also in larvae of *Aptinothrips rufus* collected from halophytic plants.

Sclerotisation of areas upon one part of the body is not necessarily correlated with that upon others.

(b) *The Body Divisions* (see figs. 5-10).

The head is usually greater in length than in breadth (as measured in ventral aspect from the apex to the posterior margin), but in *Aeolothrips*, and possibly in *AELOTHRIPIDAE* generally, it is almost circular in outline, and here the mouth-cone is short and not closely opposed to the ventral surface as in other forms. That of the *HELIOTHRIPINAE* is comparatively broad anteriorly: *Limothrips*, *Aptinothrips*, and at least the majority of *THRIPINAE* have a narrow elongate head. In *Dendrothrips* it is oval, in *Scirtothrips* broadly

ovate, and in *Scolothrips pyriform* (fig. 1). Dorsally the posterior portion is overlapped by the prothorax.

The *thorax* is composed of three distinct segments, of which the prothorax is trapezoid in shape, the mesothorax gradually expanded towards its posterior

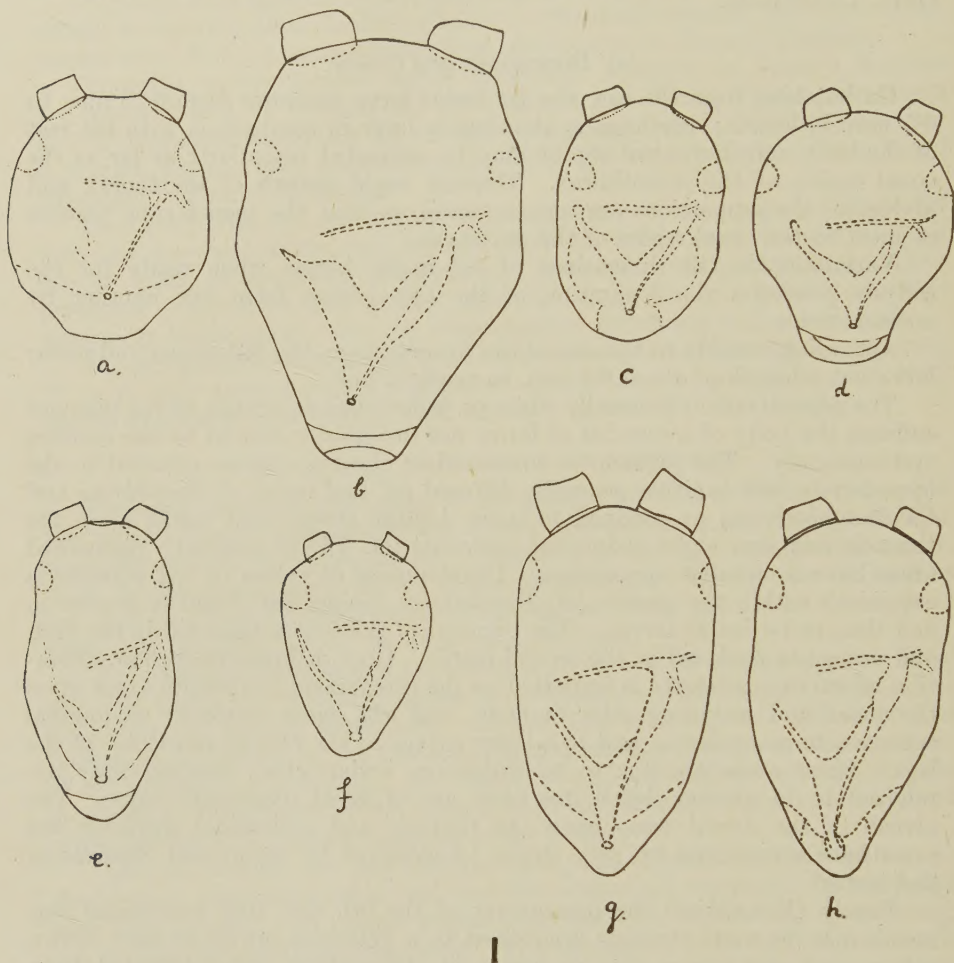
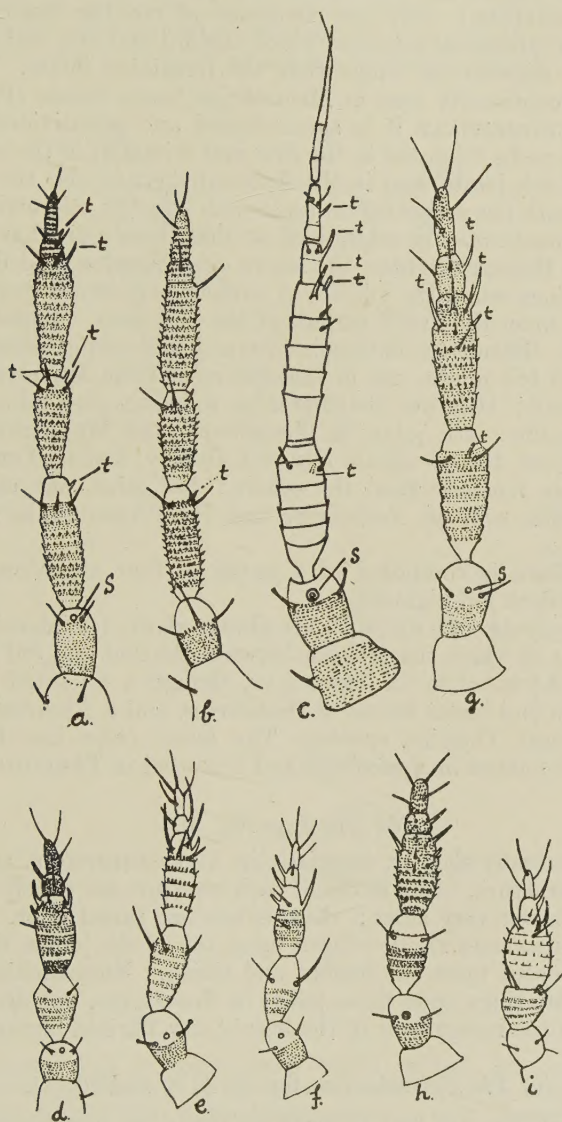


FIG. 1.—The head, in outline from below. $\times 230$. (The antennae and palpi are not shown.) b-h, 2nd instar; a, 1st instar. a, *Aeol. fasciatus*; b, *Hel. haemorrhoidalis*; c, *Dend. degeeri*; d, *Scirt. longipennis*; e, *Apt. rufus*; f, *Scol. sexmaculatus*; g, *Kak. pisivorus*; h, *Taen. vulgatissimus*.

margin, and the metathorax, of uniform girth, usually constitutes the stoutest portion of the body.

The *abdomen* is made up of 11 segments, of which all but the last are cylindrical; the first is little narrower than the metathorax, and the 9th and 10th are of lesser girth than those preceding them, the 10th not being especially elongate as in larvae of the Tubulifera. The 11th segment is generally small, and to a great extent retractile within the 10th; in *Heliothrips*, however, it is expanded posteriorly and assumes the shape of a funnel.



2

FIG. 2.—Antennae. $\times 230$. 2nd instar, right side from above, except where otherwise indicated. a, *Aeol. fasciatus*; b, *Aeol. fasciatus* (1st instar from below); c, *Hel. haemorrhoidalis*; d, *Apt. rufus* (left side); e, *Scirt. longipennis*; f, *Scol. sexmaculatus* (left side); g, *Kak. pisivorus*; h, *Thr. validus*; i, *Thr. fuscipennis* (1st instar); s, sensorium; t, trichome.

(c) *Appendages and Sense-organs of the Head.*

The *antennae* (fig. 2) are slender and attain at most a length of 0.4 mm. in the HELIOTHRIPINAE; they are composed of not less than six, and not more than seven cylindrical joints, of which the 3rd and 4th, and in *Aeolothrips* also the 5th are respectively longer than the remaining joints. The terminal joint (7th) is exceptionally long in *Melanthrips fuscus* Sulzer (Priesner 1928), and in the HELIOTHRIPINAE it is spear-shaped and sub-divided so that the antenna appears to be 8-jointed in the first and 9-jointed in the second instar.

The 3rd and 4th joints, and in the AEOLOTHRIPIDAE also the 5th, 6th and 7th, are ringed with fine seams (often beset with hair-like microtrichia) between which the integument may be sclerotised, so that these joints have an annulate appearance; in HELIOTHRIPINAE the seams are irregular, and do not always form complete rings round the joints. A circular pore-like sensorium is always present distally upon the upper surface of the 2nd joint. Simple filamentous trichomes, often difficult to distinguish from neighbouring setae, occur upon the 3rd, 4th, and 5th joints, and in *Aeolothrips* and the HELIOTHRIPINAE also upon the 6th joint; they are distributed as follows:—3rd joint, one distally upon the underside: 4th joint, in *Aeolothrips*, and HELIOTHRIPINAE, two; in other THIRIPIDAE, three; all are situated distally, and in THIRIPIDAE one is shorter and more truncate than the others: 5th joint, one upon the outer margin; 6th joint, only in *Aeolothrips* and HELIOTHRIPINAE, one upon the outer margin.

The *eyes*. Each is composed of a group of four stemmata overlying a mass of light or dark red pigment.

The *maxillary palpi* (see fig. 5, B) are always short, 4-jointed in *Aeolothrips*, in the 2nd instar of which the division between the 2nd and 3rd joints is often indistinct, and 3-jointed in all THIRIPIDAE, though a 4-jointed condition has been met with in 2nd instar larvae of *Heliothrips*, and a 2-jointed in individual specimens amongst Thripine species. The *labial palpi* (see fig. 5, B) are inconspicuous, 3-jointed in *Aeolothrips* and 2-jointed in THIRIPIDAE.

(d) *The Legs* (fig. 3).

These are generally slender, especially in AEOLOTHRIPIDAE, and show great uniformity of structure. The coxae of each segment are widely separate, and the femora are never very stout; there is but one tarsal joint. No spines or other chitinous processes are developed upon any of the joints, though specialised setae may occur upon the femora and tibiae. Microtrichia are arranged in widely separate rings upon these joints in *Aeolothrips*, but do not appear to be present upon the integument of the legs in any Thripid larvae.

(e) *The Spiracles* (see figs. 7, A, 8, and 10, A).

In all forms there is a pair of spiracles upon the mesothorax,¹ and upon the 8th abdominal segment; a third pair is present upon the 2nd abdominal segment of most larvae, but is absent in both instars of *Heliothrips haemorrhoidalis* and *Scirtothrips longipennis*, and in the 2nd instar of *Thrips tabaci*. The peritreme of each mesothoracic spiracle is situated at the anterior lateral angle of the segment; its surface is clearly beset with many rounded facets, and in 2nd instar larvae measures from 10 μ diameter (*Scirtothrips*) up to 25 $\mu \times 10 \mu$

¹ Williams (1915 : 233) figured a pair of spiracles upon the metathorax of *Kakothrips*; this error has been repeated by Kutter and Winterhalter (1933 : 280) in a table giving distinctions between 1st and 2nd instar larvae of this insect.

in larger forms. The peritremes of the spiracles upon the 2nd abdominal segment are placed dorsally in its anterior portion, between the lateral and marginal setae of each side, but in both instars of *Aeolothrips* and in some 1st instar larvae of THRIPINAE they occupy a marginal position outside the latter pair of setae. A small accessory peritreme anterior to each spiracle

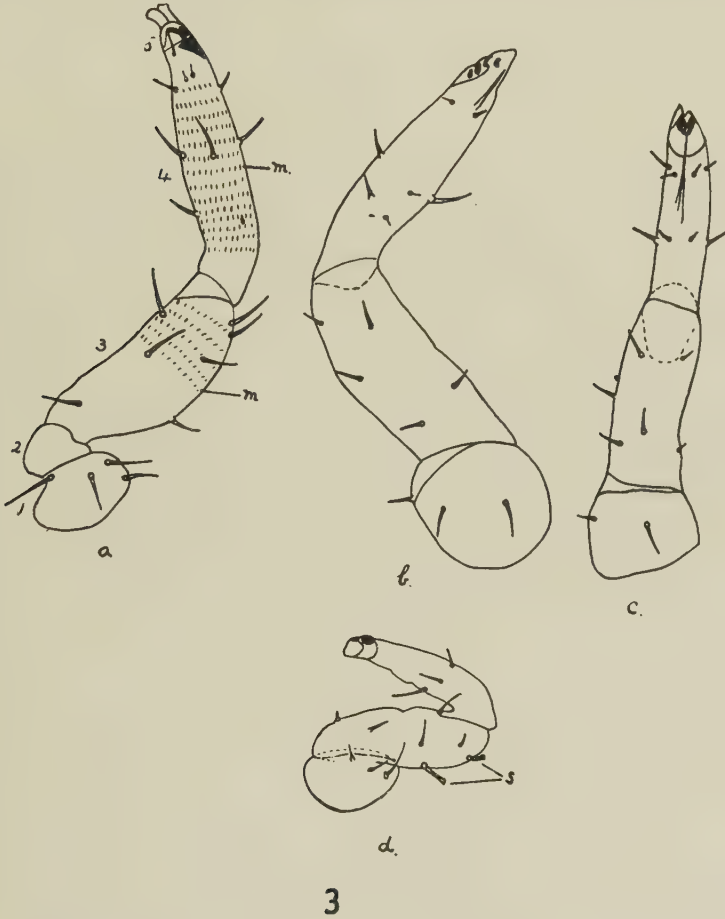


FIG. 3.—Prothoracic legs, in outline from below. $\times 230$. 2nd instar, except a. a, *Aeol. fasciatus* (1st instar); b, *Hel. haemorrhoidalis*; c, *Thr. validus*; d, *Scirt. longipennis*. m, microtrichia; s, specialised setae; 1, coxa; 2, trochanter; 3, femur; 4, tibia; 5, tarsus.

occurs in *Dendrothrips degeeri* (2nd instar). The peritremes upon this segment have a diameter of only 5μ in *Aeolothrips* and *Aptinothrips*, but attain dimensions of over $25\mu \times 10\mu$ in *Anaphothrips obscurus* and *Taeniothrips inconsequens*. Upon the 8th abdominal segment the peritremes are situated marginally in its anterior or median portion; their structure and dimensions are similar to those of the 2nd abdominal segment. In *Hercinothrips femoralis* the peritremes of all the spiracles are raised upon truncate tubercles.

(f) *The Pori* (see fig. 10, A).

Single pairs of clear pori, 2–3 μ in diameter, are present upon the dorsal surface of each of the 9th and 10th abdominal segments. In 2nd instar larvae of *Aeolothrips*, the HELIOTHIRIPINAE, CHIROTHIRIPINAE, and *Dendrothrips degeeri* there is also a pair dorsally upon the 8th abdominal segment. The porus is a simple convex structure, resembling an ocellar facet devoid of underlying pigment.

IV. THE INTEGUMENT.

i. *Detailed Structure* (see figs. 44–48).

The integument of the head is smooth, and only in *Aeolothrips* are minute hair-like structures known as microtrichia sparsely distributed upon the epicranium. That of the thoracic and first eight abdominal segments is beset with microtrichia in *Aeolothrips*, and in THIRIPIDAE with small “plaques,” which are usually indistinct upon the dorsal surface of the prothorax. The plaques may be round, oval, or oblong, and are arranged in regular parallel rings round the segments. Often those in the more anterior portions of each segment are darkened posteriorly, and bear a microtrichium,² the plaques in the posterior portions remaining simple; especially in 2nd instar THIRIPINAE the number of microtrichium-bearing plaques increases towards the 8th abdominal segment, upon which only those of the two or three posterior rings are devoid of a microtrichium. A peculiar condition obtains in 2nd instar larvae of *Scirtothrips longipennis*, in which minute dark dot-like plaques are distributed evenly over the dorsal, and extend round the sides for some distance on to the ventral surface, where they are not darkened. Under very high magnification a short hyaline microtrichium is seen to be attached at least to many of the plaques,³ which, in the 1st instar, are not darkened dorsally or laterally. The plaques of *Dendrothrips degeeri* are somewhat similar, but are less conspicuous and are devoid of microtrichia. In no form have microtrichia been found upon the integument between plaques. Upon the 9th abdominal segment the plaques, at least in the anterior portion, are reduced in size and the rings more widely separated; in both instars of *Anaphothrips obscurus*, however, the dorsal plaques increase in size towards the posterior margin, and the comparatively conspicuous plaques bordering the latter give the false impression of a transverse row of chitinous projections such as apparently occur only in THIRIPINAE (cf. Priesner 1928 : 186). In the majority of THIRIPINAE, plaques upon this segment are replaced by microtrichia, which are especially long (up to 7 μ) and conspicuous in the 1st instar of *Thrips viminalis* Uzel. Upon the integument of the 10th abdominal segment these structures become very minute, but rings of microtrichia are discernible in both instars of *Aeolothrips*. Rings of microtrichia occur upon the 3rd to 7th antennal joints and upon the femora and tibiae of the legs in *Aeolothrips*, and upon the 3rd and 4th antennal joints in at least the majority of THIRIPIDAE. Paired areas upon the dorsal surface of each thoracic segment of 2nd instar larvae are devoid of plaques: they comprise a considerable portion of the dorso-lateral surface of the prothorax,

² The term “microtrichia” appears as yet to have been used only in the plural. As reference to single microtrichia has to be made, the term “microtrichium” is adopted throughout this paper. For brevity in hyphenating, the root of the word has been used, e.g. microtrich-bearing, microtrich-like.

³ Ahlbery (1924 : 21) states that the integument is thickly beset with minute plaques devoid of microtrichia, and Priesner (1928 : 465), in a key to larvae, also refers to absence of microtrichia.

a small anterior and a larger posterior pair, rounded or oval in shape, upon the mesothorax, and a single pair similar to the latter upon the metathorax. The integument in these areas is subject to sclerotisation, and in many forms assumes a grey colour, but whether sclerotised or not, plaques, which are merged into them peripherally, are absent—at least from their central portions, though, should they occur in a particular species, some microtrichia may remain upon their surfaces. In 1st instar larvae, on the other hand, these paired smooth areas, which are less often sclerotised, are discernible only in some forms (cf. *Aeolothrips*) and are not represented in those of many THRIPINAE.

ii. *Larger Chitinous Processes.*

Larger chitinous processes, distinct from setae, are practically confined to the dorsal surface of the 9th abdominal segment, though Priesner (1928 : 222) refers to the presence of thorn-like structures upon the ventral surface of the 8th and 9th segments in species of the genus *Odontothrips*.

Also, three pairs of hyaline filamentous structures are attached to the rim of the expanded 11th abdominal segment in *Heliothrips* and *Hercinothrips*.

The posterior margin of the 9th abdominal segment in 1st instar larvae of THRIPINAE is beset with small filamentous projections; in the 2nd instar these take the form of short more strongly sclerotised teeth, developed to a greater extent upon the dorsal than upon the ventral surface; they appear to be modified microtrichia. The 2nd instar of *Taeniothrips inconsequens* is remarkable for the large size and definite number (4 pairs) of these structures. In *Thrips angusticeps* neighbouring processes upon the dorsal surface are often fused to form blunt scale-like projections.

The 2nd instar larva of *Aeolothrips* possesses two pairs of conspicuous spines, each raised upon a sclerotised tubercle upon the dorsal surface of the 9th abdominal segment, in its posterior moiety, but not upon its posterior margin.

iii. *Sclerotisation.*

Sclerotisation of the integument may impart to certain definite regions upon the head, thorax, and the 9th and 10th abdominal segments a grey, brownish-yellow, and rarely a dark brown colour. The position and extent of these areas, which are more highly developed in 2nd instar larvae, are of great diagnostic value.

Paired and definitely outlined spots upon the dorsal surface of the thoracic segments have the appearance of integumental glands, but although, as Dr. V. B. Wigglesworth, F.R.S., points out, they appear to have some connection with the muscles or fat body, integumental plaques are merged into them peripherally, and both he and Dr. A. D. Imms, F.R.S., who kindly examined mounted specimens, are of opinion that they should be regarded as sclerotised areas.

Upon the head there is usually a rhomboidal grey area dorsally at its apex; in *Limothrips* and *Aptinothrips* this takes the form of a definite brownish-yellow plate. A similar grey area is sometimes present also upon the vertex in ventral aspect (cf. *Thrips validus*). Sclerotisation of the head is most marked in some species of the genus *Thrips* (*T. validus*, *T. angusticeps*); in these the whole head capsule from the region of the eyes to the posterior margin in dorsal, and to the clypeus in ventral aspect, is of a yellowish-grey colour, leaving only a narrow light portion in the median line of both surfaces.

The greater portion of the prothorax in dorsal aspect, in *Limothrips*, *Aptinothrips*, and some species of *Thrips* (cf. *T. validus*) is occupied by paired masses of rounded or oval grey spots. In *Aeolothrips*, *Dendrothrips degeeri*, most species of *Taeniothrips*, and in some other species of *Thrips* (*T. physapus* and *T. viminalis*) they are represented by definitely outlined and more or less isolated paired spots, the number of which is fairly constant within the species.

A single pair of bifid grey spots closely contiguous to the apodeme (see fig. 6, B) of each side (posterior to the prothoracic coxae) is present upon the ventral surface in some forms (*T. validus*).

Upon the dorsal surface of the mesothorax, an anterior smaller, and a larger posterior pair of rounded or angular grey areas are present in many 2nd instar and a few 1st instar larvae; upon the metathorax only the latter pair is represented. All are particularly well developed in *Dendrothrips degeeri* and *Thrips validus*.

In ventral aspect such spots are rare upon these segments, but according to Priesner (1926-28:397) they are present in *Thrips minutissimus* L. Throughout the larvae examined a weakly sclerotised plate (see figs. 7, B and 9), possibly representing the trochantin of other insects, is situated immediately anterior to each meso- and metathoracic coxa; these plates appear always to be beset with one or more rows of microtrichia. The arms of the furca are often visible between the coxae of each side.

The basal portions of setae upon the dorsal surface of the meso- and metathorax and first eight abdominal segments in *Scirtothrips* (2nd instar) are surrounded by circular and shallow sclerotised depressions, and upon the prothorax in addition, those of *Aeolothrips* (1st instar only) are encircled by grey areas. Otherwise, only in *Dendrothrips degeeri* (2nd instar) has any sclerotisation of the integument been observed upon the more anterior abdominal segments; here a laterally placed pair of small oval spots occur upon each of the 3rd to 9th abdominal segments inclusive in dorsal aspect.

The greater portion of the integument of the 9th and 10th abdominal segments is sclerotised to a deep brown colour in *Kakothrips* (2nd instar) and to a brownish-yellow in *Heliothrips* and the CHIROTHRIPINAE. Dorsally, a grey sclerotisation of the integument, when present, is confined to the posterior portion of each of these segments in many THRIPINAE, and its extent is of diagnostic value.

The annulate appearance of certain antennal joints is due to well-marked rings of sclerotised chitin, and the terminal joints as well as proximal portions of the femora and tibiae of the legs often assume a grey colour.

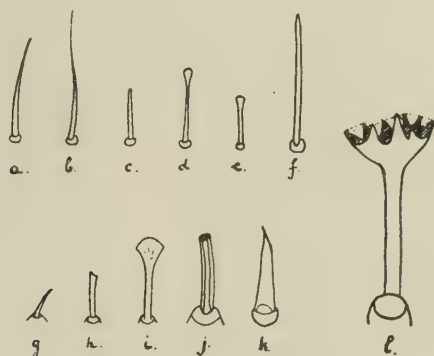
V. THE SETAE.

(a) *Structure* (fig. 4).

The type of seta most prevalent amongst the larvae is simple, and consists of a circular alveolus from the cup of which springs a straight or slightly bowed seta-shaft, the distal extremity of which is sharply pointed. It is noteworthy that all larvae possess some setae, the shaft of which measures only some $5\ \mu$ in length. The majority of setae, however, are of greater length, and measure as much as $100\ \mu$ upon the 10th abdominal segment of *Kakothrips* (2nd instar) and $150\ \mu$ in *Aeolothrips* (1st instar); those upon the head and thoracic segments are usually of moderate length, but are some $80\ \mu$ long in

Scolothrips (2nd instar). Both instar larvae of *Hercinothrips*, *Scirtothrips* and *Dendrothrips* have very short setae on all parts of the body, while long setae are prevalent in *Aeolothrips*, *Scolothrips*, and *Kakothrips*.

The 2nd instar larvae of *Limothrips* and *Aptinothrips* possess very short setae generally, while certain pairs upon the thorax and abdomen, ventrally or laterally, attain a great length. The 1st instar larvae of all forms except HELIOTHIRIPINAE and one or two species of the genus *Thrips* have a remarkably long seta upon the meso- and metathoracic coxae, and ventrally upon the 2nd antennal joint. Otherwise, setae upon the antennae and legs are usually short, though Ahlberg (1924) described long setae ($60\ \mu$) upon the femora and tibiae of *Euchaetothrips*.



4

FIG. 4.—Types of setae (from 2nd instar larvae). $\times 230$. a, acute (*Aeolothrips*); b, flagelliform (*Limothrips*); c, blunt (*Thr. viminalis*); d, (*Thr. viminalis*); e, (*Scirtothrips*), knobbed; f, (*Kakothrips*); g, (*Hercinothrips*), penicilliform; h, fimbriate (*Anaphothrips*); i, crateriform (*Parthenothrips*); j, truncate (*Kakothrips*); k, acuminate (*Kakothrips*); l = i more highly magnified.

In a number of different forms, not necessarily related to one another systematically, some setae, but never all, may be modified at their apices in various ways, and sometimes in extraordinary manner. Such setae are here termed "specialised." When they occur upon the head and thorax, similarly modified setae are sometimes also to be found upon the 2nd and 3rd antennal joints and upon the femora and tibiae of all the legs (cf. *Parthenothrips* and 1st instar of *Scirtothrips*). Specialised setae may occur in the 1st instar but not in the 2nd instar of a species (cf. *Taen. inconsequens*, 9th abdominal segment), but it is usual for setae to be modified similarly in both instars of the same species. An exception to this is *Kakothrips* (9th and 10th abdominal segments). Attempts have been made to classify these modifications, but gradations between the various types are frequent, and there is no fixed line of demarcation between them.

In the following table the forms assumed by specialised setae in 2nd instar larvae are listed, with approximate measurements of their length and examples of genera or species in which they may readily be observed.

Shape of apex	Approx. length of setae in μ .	Examples	Distribution	Letter in fig. 4
Acute	20-50	<i>Taeniothrips</i> , <i>Thrips</i>	General	—
„	50-100	<i>Aeolothrips</i> , <i>Scolothrips</i>	General	a
Flagelliform	40-70	<i>Limothrips</i> , <i>Aptinothrips</i>	Thorax and abdomen (ventral and lateral)	b
Penicilliform	10-100	<i>Hercinothrips</i> , <i>Chaetanaphothrips</i> , <i>Kakothrips</i>	General, dorsal	f, g
Blunt	10-50	<i>Heliothrips</i> , <i>Thrips viminalis</i> and <i>sambuci</i>	General, dorsal	c
Knobbed	10-20	<i>Scirtothrips longipennis</i>	Head, prothorax, legs, 9th abdominal segment (dorsal)	e
„	30-50	<i>Taeniothrips vulgatissimus</i> , <i>Thrips viminalis</i>	9th and 10th abdominal segments (dorsal)	d
Fimbrillate	10-40	<i>Anaphothrips obscurus</i>	General, dorsal	h
„	10-20	<i>Dendrothrips degeeri</i>	Abdomen, lateral	—
Crateriform	20-60	<i>Parthenothrips</i>	General, dorsal	i
Truncate	40	<i>Kakothrips pisivorus</i>	9th abdominal segment (dorsal)	j
Acuminate	45	<i>Kakothrips pisivorus</i>	10th abdominal segment (dorsal)	k

In *Hercinothrips* and *Parthenothrips* the alveoli of the specialised setae are raised upon prominent tubercles. The greatest degree of specialisation is attained in both instars of *Parthenothrips*; here the distal portion of the seta-shaft is expanded to a large funnel-shaped and radiate structure, and the majority of setae, at least upon the dorsal surface, are modified in this manner. The disposition upon the body of specialised setae is given hereafter under each species dealt with.

(b) *Chaetotaxy*.

The setae of the main body-divisions are arranged in pairs, and their disposition shows a remarkable regularity throughout the Terebrantia. The total number of pairs upon the head, prothorax, mesothorax, and the 4th to 8th abdominal segments, inclusive of the 2nd instar larva of any one species, is always greater than that upon the corresponding regions of the 1st instar. By observation of setae of the 2nd instar underlying the integument of 1st instar larvae shortly prior to ecdysis, it has been possible to determine the pairs which are newly formed in the former. In figs. 5-10 are shown diagrammatically the maximum number of pairs which have as yet been observed in any species, and their approximate position upon the various regions of the body. Except for those upon the clypeus and maxillary region of the head and upon the 11th abdominal segment, numbers have been affixed to the pairs upon the head, the thoracic, and the abdominal segments severally; in addition, letters (a to k) have been used to indicate the position of inconspicuous pairs, which, nevertheless, appear, with the exception of those marked "k" on the 9th abdominal segment, to be present in all 2nd instar larvae. From this, however, it must not be inferred that the lettered setae are necessarily less conspicuous than those which bear numbers (cf. *Dendrothrips*), though they are so in the majority of forms. They are referred to

hereafter as "accessory" setae. The disposition of setae being similar upon each of the 4th to 8th abdominal segments inclusive, segments 4 to 7 have been omitted from the illustrations, figs. 5-10.

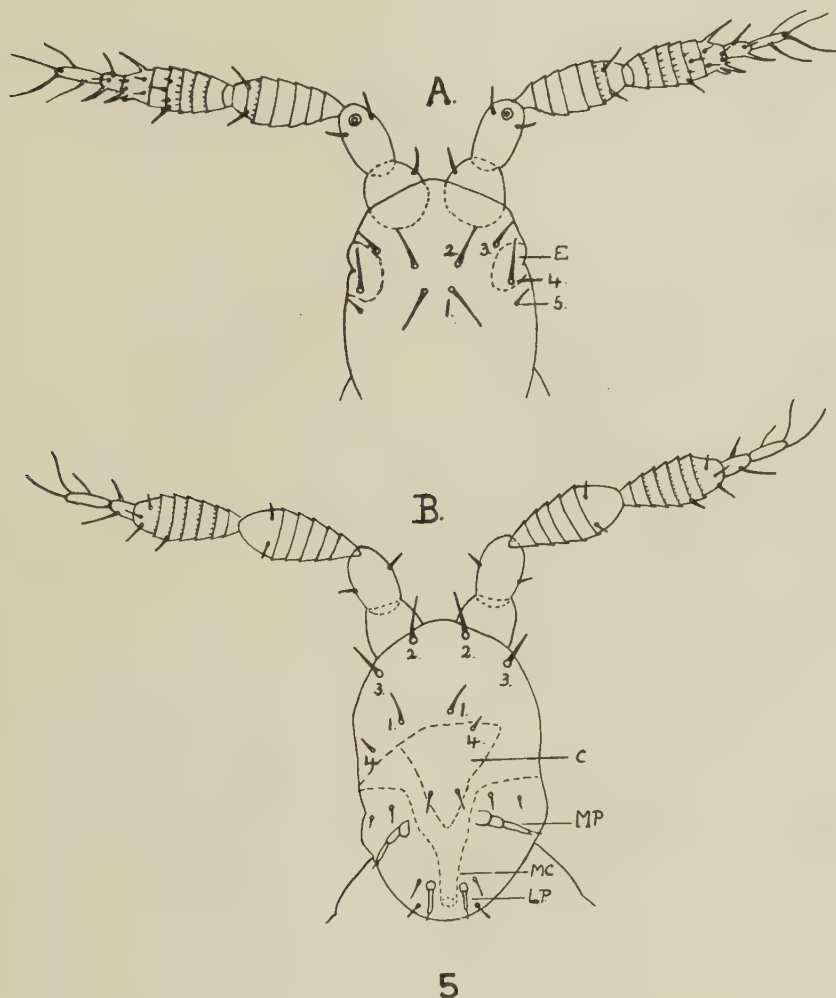


FIG. 5.—Chaetotaxy of the head. 2nd instar. A, dorsal aspect; B, ventral aspect. 1-5, pairs of setae; C, clypeus; E, position of eye; LP, labial palp; MC, mouth-cone; MP, maxillary palp.

Setae of the 2nd instar larva.

Head (fig. 5, A and B)

Dorsal aspect : 5 pairs.

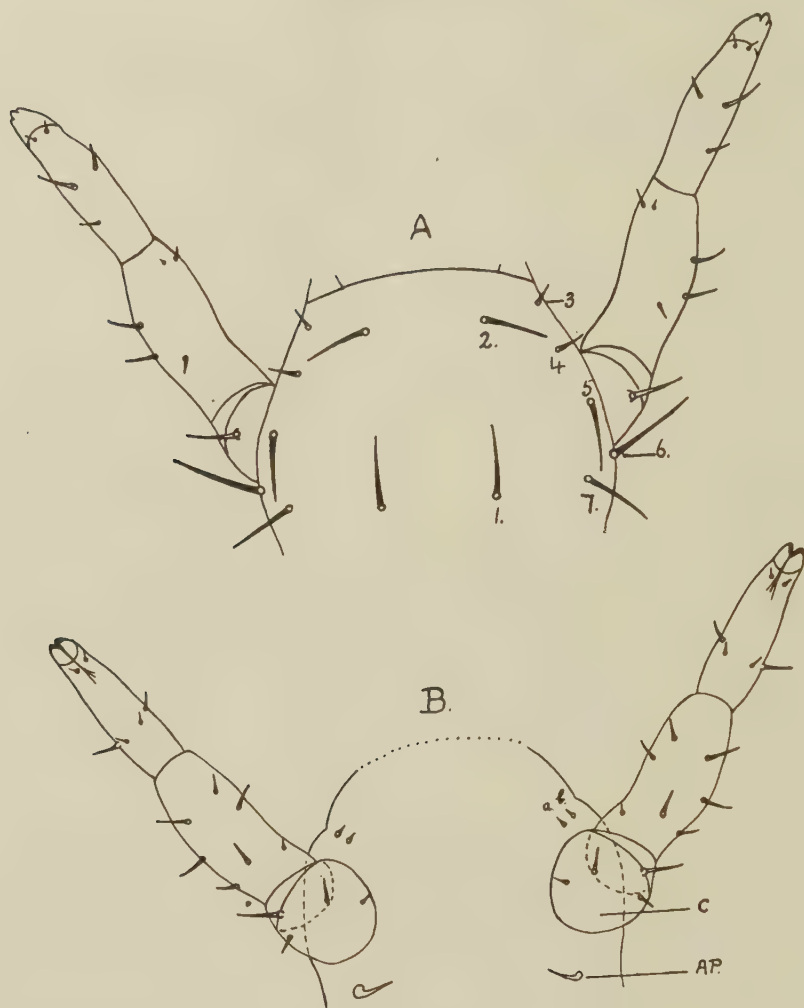
Ventral aspect—upon the frons—4 pairs (the setae of 1 pair upon the clypeus, 2 pairs laterally upon the maxillary region, and 2 pairs in the region of the labial palpi have no numbers or letters assigned to them).

Prothorax (fig. 6, A and B).

Dorsal aspect : 7 pairs. Exception—*Parthenothrips*, pair 4 wanting.

Ventral aspect : 2 accessory pairs, a and b only.

Mesothorax (fig. 7, A and B). Dorsal aspect: 7 pairs, and 1 accessory pair c. Exceptions—*Heliothrips*, *Limothrips*, *Aptinothrips*, and often *Parthenothrips*, pair 3 wanting; *Parthenothrips*, pair 2 wanting.



6

FIG. 6.—Chaetotaxy of the prothorax. 2nd instar. A, dorsal aspect; B, ventral aspect. 1-7, pairs of setae; a, b, pairs of accessory setae; AP, apodeme; C, coxa.

Metathorax (figs. 8 and 9).

Ventral aspect: 3 pairs, and 2 accessory pairs d and e. Exception—*Dendrothrips*, pair 3 wanting.

Dorsal aspect: 5 pairs. Exceptions—*Heliothrips* and *Hercinothrips*, pair 3 wanting. *Parthenothrips*, pairs 2 and 3 wanting.

Ventral aspect: 3 pairs and 2 accessory pairs f and g. Pair 3 is wanting in all forms listed, except *Aeolothrips* and the HELIOTHIRIPINAE.

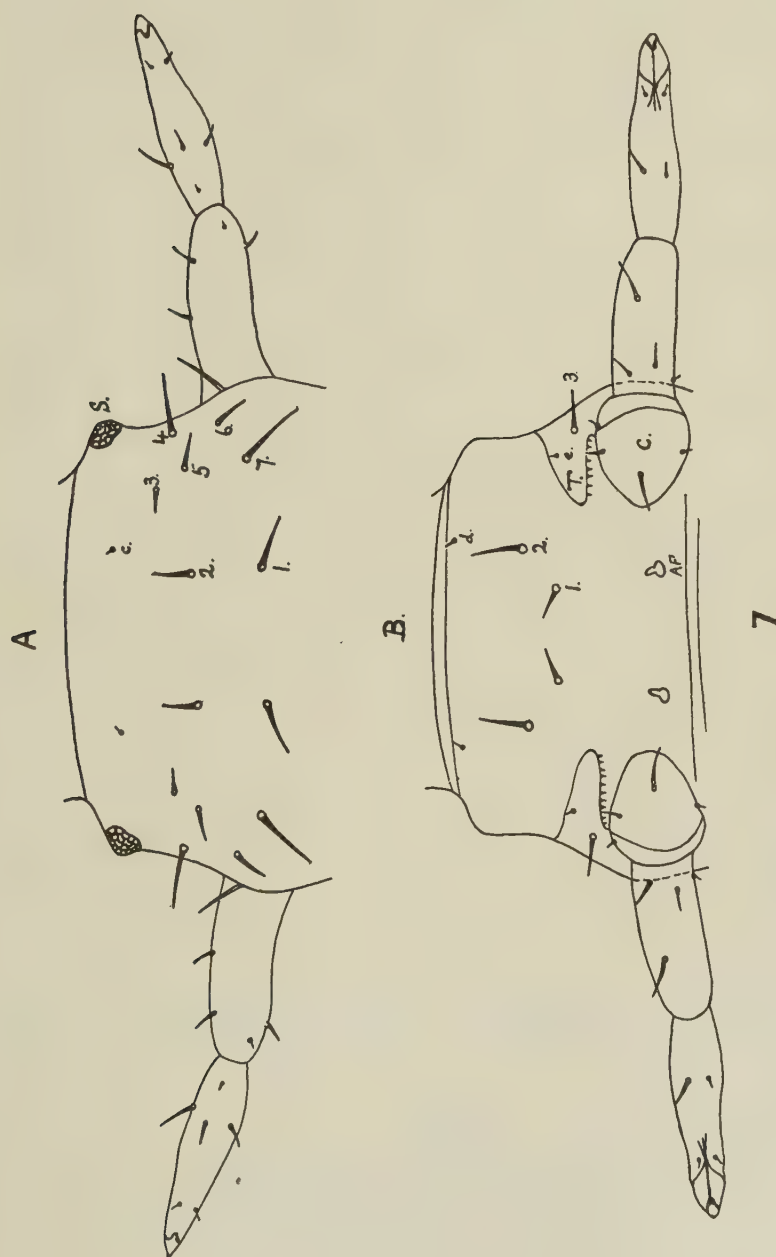
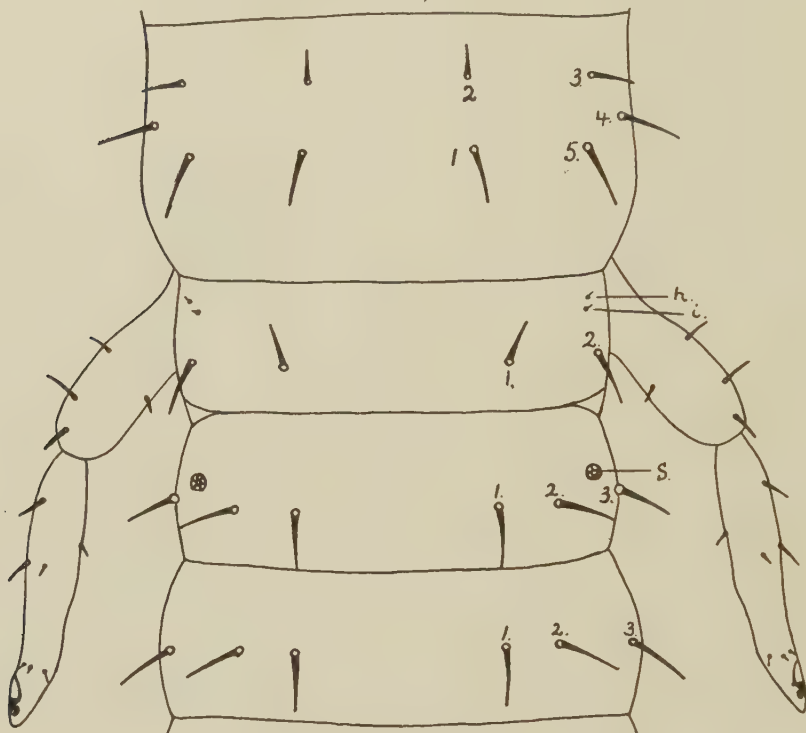


FIG. 7.—Chaetotaxy of the mesothorax. 2nd instar. A, dorsal aspect; B, ventral aspect. 1-7, pairs of setae; c, d, e, pairs of accessory setae; AF, arm of furca; C, coxa; S, spiracle; T, trochantin.

Abdomen (figs. 8-10).

- Segment I. Dorsal aspect : 2 pairs and 2 accessory pairs h and i.
 Ventral aspect : none.
- „ II. Dorsal aspect : 3 pairs.
 Ventral aspect : 2 pairs and 1 accessory pair j. Except possibly in the HELIOTHIRIPINAE, the presence of pair 2 is not always constant within the species.
- „ III. Dorsal aspect : 3 pairs.
 Ventral aspect : 1-3 pairs, not constant within the species.



8

FIG. 8.—Chaetotaxy of the metathorax, and first three abdominal segments. 2nd instar.
 Dorsal aspect. 1-5 pairs of setae; h, i, pairs of accessory setae; S, spiracle of 2nd abdominal segment.

- Segment IV-VIII. Dorsal aspect : 3 pairs.
 Ventral aspect : 3 pairs.
- „ IX. Dorsal aspect : 2 pairs and an accessory pair k. The latter is wanting in *Aeolothrips*.
 Ventral aspect : 1-3 pairs, not constant within the species.
- „ X. Dorsal aspect : 2 pairs. Exception—HELIOTHIRIPINAE, pair 2 wanting.
 Ventral aspect : 2 pairs.
- „ XI. Dorsal aspect : 1 pair. Setae very minute and wanting in HELIOTHIRIPINAE.
 Ventral aspect : 2-3 pairs. Setae very minute and wanting in HELIOTHIRIPINAE.

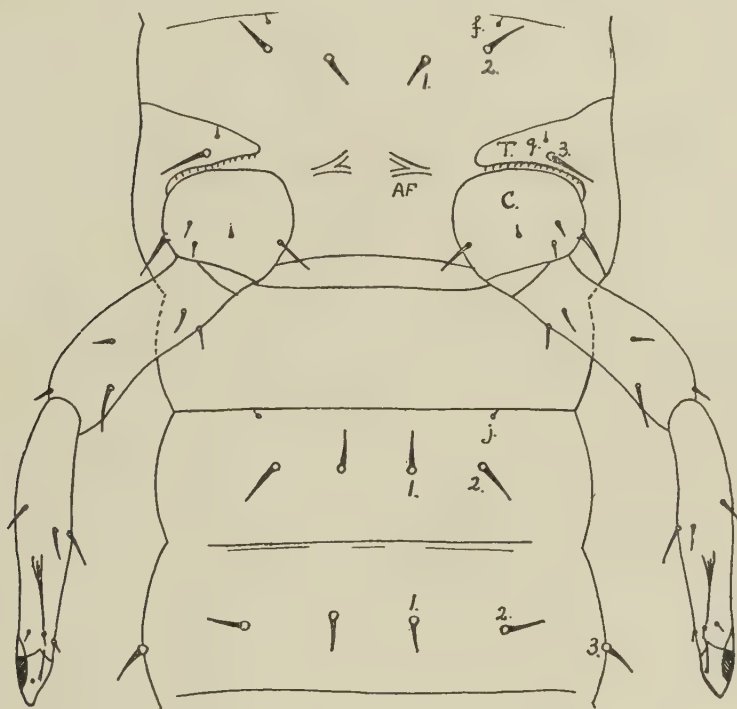
Upon certain regions of the body, especially of the thorax, the setae of 1st instar larvae are generally inconspicuous, and their number and arrangement difficult to determine. An attempt has, however, been made to compare the chaetotaxy with that of the 2nd instar larva.

Setae of the 1st instar larva.

Head.

Dorsal aspect : 4 pairs. Pair 5 wanting.

Ventral aspect : 4 pairs on the frons. Unnumbered setae also as in 2nd instar.

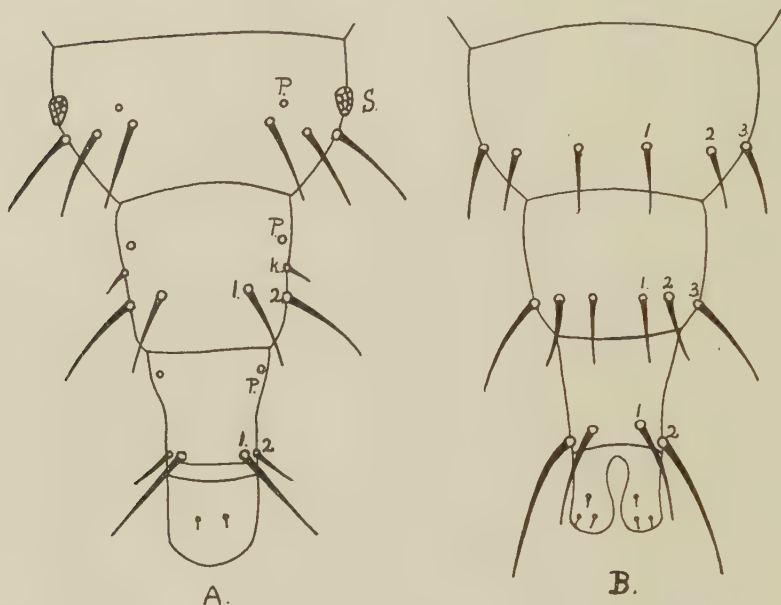


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FIG. 9.—Chaetotaxy of the metathorax, and first three abdominal segments. 2nd instar. Ventral aspect. 1-3, pairs of setae; f, g, j, pairs of accessory setae; AF, arm of furca; C, coxa; T, trochantin.

Prothorax.	Dorsal aspect : 6 pairs. Pair 6 wanting. Exception— <i>Parthenothrips</i> , pair 4 wanting.
Mesothorax.	Ventral aspect : only accessory setae present. Dorsal aspect : 4 pairs, and one accessory pair c. Pairs 2, 3, and 5 wanting.
Metathorax.	Ventral aspect : only accessory setae present. Dorsal aspect : 4 pairs. Pair 2 wanting. Exception— <i>Parthenothrips</i> , pair 3 wanting.
Abdomen.	Ventral aspect : only accessory setae present.
Segment I.	Dorsal aspect : 2 pairs, and 1 or 2 accessory pairs. Ventral aspect : none.

Abdomen,		
Segment II.	Dorsal aspect :	3 pairs.
	Ventral aspect :	1 pair and 1 accessory pair.
„ III-VIII.	Dorsal aspect :	3 pairs.
	Ventral aspect :	1 pair. Pairs 2 and 3 wanting.
„ IX.	Dorsal aspect :	2 pairs. Accessory pair k never present.
	Ventral aspect :	1-2 pairs. Not constant within the species.
„ X.	Dorsal aspect :	2 pairs. Exceptions— <i>Aeolothrips</i> and <i>HELIO-</i>
		<i>THRIPINAE</i> , pair 2 wanting.
	Ventral aspect :	2 pairs.
„ XI.	As in 2nd instar.	



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FIG. 10.—Chaetotaxy of 8th-11th abdominal segments. 2nd instar. A, dorsal aspect; B, ventral aspect. 1-3, pairs of setae; k, pair of accessory setae; P, poria; S, spiracle of 8th segment.

VI. CHARACTERS FOR THE SEPARATION OF 1ST AND 2ND INSTAR LARVAE.

The 1st and 2nd instar larvae can only be distinguished from one another with certainty through differences in the chaetotaxy of the 4th to 8th abdominal segments, inclusive, *in ventral aspect*.

In 1st instar larvae, there is only one pair of setae (the medium pair numbered 1) upon each of these segments, while in the 2nd instar larva there are always three pairs—a median, a lateral, and a marginal. One other characteristic is the absence of the inconspicuous pair of setae immediately posterior to the eyes (numbered 5) in 1st instar larvae.

Characteristics for separation given by various authors relate to (1) differences in the shape of the 3rd and of the two terminal joints (taken together) of the antenna, but these apply only to *THRIPIDAE* and do not hold good

even for all forms in this family; (2) the greater length of setae upon the 10th abdominal segment of the 1st instar—a feature which is not applicable to *HELIOTHRIPINAE* and many *THRIPINAE*; and (3) the presence in the 1st instar of a conspicuously long seta upon the underside of the 2nd antennal joint, a seta, however, which is quite short in the *HELIOTHRIPINAE* and at least some species of the genus *Thrips*.

More applicable is the absence in 1st instar larvae of any conspicuous setae upon the ventral surface of the meso- and metathoracic segments, but the anterior accessory setae (fig. 9, f) upon the metathorax of *HELIOTHRIPINAE*, though short, are as conspicuous as those upon the coxae.

The 1st instar larvae of most forms possess a comparatively long seta upon each meso- and metathoracic coxa, but this is not outstandingly so in *HELIOTHRIPINAE*, *Scirtothrips*, or in *Chaetanaphothrips*.

Reduction in the number of pairs of setae upon the dorsal surface of the thoracic segments in 1st instar, as compared with 2nd instar larvae, though constantly apparent, is not considered to be a convenient characteristic owing to the setae of many forms being difficult to observe in this region.

VII. CHARACTERS OF DIAGNOSTIC VALUE IN THE DETERMINATION OF LARVAE.

The larvae of Terebrantia here dealt with are included in the *AEOLOTHRIPIDAE* (represented only by a single species of the genus *Aeolothrips*) and *THRIPIDAE*, which are readily separable through differences in the position of the mouth-cone and structure of the antennae. Of the Thripid sub-families, antennal characteristics serve only to distinguish the *HELIOTHRIPINAE* from the others, amongst which the structure of these appendages (as well as of the legs) show uniformity both in respect of the number of joints of which they are composed, the relative dimensions of these, and the disposition of sense-organs and setae upon them. The number of joints into which the maxillary palpi are divided is not, within limits, constant for the species, and, with the labial palpi again no valid distinctions are offered. With the material available it would not be safe to separate either the sub-families or genera upon differences in the shape and dimensions of the head or any of the body divisions, and there are indications that there may be wide divergence in such characters within the genera, on the one hand, and close similarity in species of widely separate genera on the other.

In no representative of the sub-families *HELIOTHRIPINAE*, *CHIROTHRIPINAE*, and *SERICOTHRIPINAE* examined or of which descriptions are available, is the posterior margin of the 9th abdominal segment beset with tooth-like or microtrich-like processes; if *Scolothrips*, a peculiar genus of uncertain relationship, is removed from it, this characteristic separates the *THRIPINAE* from other *THRIPIDAE*.

Amongst the heterogeneous assemblage of forms included in the *SERICOTHRIPINAE*, the absence of any long setae even upon the posterior abdominal segments and the presence of dot-like plaques upon the integument dorsally would appear to separate off the genera *Dendrothrips* and *Scirtothrips* from *Anaphothrips* and the *CHIROTHRIPINAE*. The presence of long whip-like setae, especially upon the ventral surface of some thoracic, and more posterior abdominal segments is common to *Limothrips* and *Aptinothrips*, but at least one species of the genus *Anaphothrips* possesses a pair of such setae ventrally upon the metathorax. At present it is not possible to formulate characteristics by which some of the sub-families or any of the genera can be distinguished

from one another with any certainty. The separation of species has been based upon the following diagnostic characters, which, through examination in some cases of large numbers of specimens from different host-plants and localities, appear to be reasonably constant :—

(1) The presence or absence of sclerotised areas or spots, and, in the former case, their nature and distribution, especially upon the 9th abdominal segment and the prothorax ; in the synopsis of larval characters (Section VIII) allusion to their presence upon the head and other thoracic segments has been purposely avoided, owing to a certain inconstancy, especially amongst 1st instar larvae. Sclerotised areas should be examined by reflected light, obtained by placing a piece of white paper beneath the specimen or preparation.

(2) The presence or absence of spiracles upon the 2nd abdominal segment.

(3) The nature of specialised setae and their distribution upon the main divisions of the body.

(4) The *general* length of setae upon various regions of the body ; for the separation of species or groups of species in the THRIPINAE, the dorsal setae upon the 7th and 8th abdominal segments in the case of 2nd instar, and the range in length of those upon the 10th abdominal segment in that of 1st instar larvae have been selected as giving the most reliable points of difference.

(5) In THRIPINAE, the approximate length of processes upon the posterior margin of the 9th abdominal segment (viewed dorsally).

(6) The nature of integumental plaques, and the presence or absence upon them of microtrichia.

Characters (1) to (5) are discernible with magnifications of about 350 diameters, but (6) may sometimes call for employment of the oil-immersion lens. In the synopsis (Section VIII) it has been found necessary to treat the 1st and 2nd instar larvae of THRIPINAE separately. Under the structural descriptions of each species in Section IX approximate dimensions of full-grown 2nd instar larvae are given ; in all cases the head has been measured as viewed from *below*, from its apex to its base just posterior to the labial palpi. It has also been considered advisable to refer to the general coloration, though, except in reference to sclerotised portions of the integument, this is very highly variable within the species.

Except in the case of *Frankliniella intonsa*, fig. 25, only the first antennal joint of each side is indicated in the outline illustrations of the various species, this having been deemed desirable in order to avoid excessive reduction of the original drawings, which have been executed by the junior author.

Measurements of the setae upon each body-division for both instars of the majority of species described are given in tables ; these are taken from individual specimens and are accurate only to the nearest 5 μ . They are designed to give a general indication of comparative length, and it should be borne in mind that there is considerable variation within the species, especially in the length of those exceeding 50 μ . In elucidating these tables, in which lines indicate the absence of a pair of setae, reference should be made to figs. 5–10, in which numbers are assigned to the setae upon each division of the body, and letters to the accessory setae (excluded from the tables except in the case of pair “k” upon the 9th abdominal segment of the 2nd instar).

VIII. SYNOPSIS OF LARVAL CHARACTERS.

Sub-Order Terebrantia.

10th abdominal segment not especially elongate; at least the 3rd and 4th antennal joints ringed with seams, all or some of which are beset with microtrichia. (In the Sub-order Tubulifera, the antennal joints are not annulate and are devoid of microtrichia.)

3 pairs of setae on each of the 4th to 8th abd. segments in ventral aspect

2nd instar.

1 pair of setae on each of the 4th to 8th abd. segments in ventral aspect

1st instar.

A. Mouth-cone short, not closely opposed to underside of head; antennae 7-jointed, 3rd to 7th joints distinctly annulate, 4th and 5th joints of about equal length

AEOLOTHRIPIDAE.

Head almost circular in outline; integument closely beset with microtrichia; majority of setae long, acute, 4th antennal joint with two distally placed trichomes. (2nd instar, 4 processes dorsally upon 9th abd. segment of equal length)

Aeolothrips.

(a) 4-5 pairs sclerotised spots dorsally on prothorax

A. fasciatus L.

AA. Mouth-cone extending at least to prothoracic coxae, closely opposed to ventral surface; 3rd and 4th antennal joints only with distinct annulations; 5th joint much shorter than 4th

THRIPIDAE.

B. Antennae 7-jointed, terminal joint sub-divided twice or thrice; 4th joint with 2 distally-placed trichomes. Posterior margin of 9th abd. segment devoid of processes. (Chaetotaxy of thoracic segments abnormal in 2nd instar)

HELIOTHRIPINAE.

1. 9th and 10th abd. segments partially sclerotised; 6 filamentous processes on 11th abd. segment; setae very short 4.

2. Spiracles on 2nd abd. segment wanting; plaques devoid of microtrichia; dorsal setae not raised on tubercles

Heliothrips haemorrhoidalis Bchi.

3. Spiracles present on 2nd abd. segment; plaques with microtrichia; dorsal setae raised on tubercles

Hercinothrips femoralis Reut.

4. Integument unsclerotised; 11th abd. segment without processes; setae long, crateriform; plaques indistinct, without microtrichia

Parthenothrips dracaenae Heeg.

BB. Antennae 6-jointed; 4th joint with 3 distally-placed trichomes.

C. Posterior margin of 9th abd. segment without processes.

D. All setae very short (not exceeding 30μ); plaques minute, dot-like (dark dorsally in 2nd instar).

1. Spiracles on 2nd abd. segment wanting; integument unsclerotised; some dorsal setae spoon-shaped

Scirtothrips longipennis Bagn.

2. Spiracles with accessory peritremes present on 2nd abd. segment; portions of integument sclerotised dorsally; some marginal setae on abd. segments fimbriate

Dendrothrips degeeri Uzel (2nd instar).

DD. At least some setae long (exceeding 35μ); plaques not dot-like, round to oblong.

1. Spiracles present on 2nd abd. segment; plaques devoid of microtrichia.

2. Portions of integument sclerotised dorsally 5.

3. Dorsal setae from head to 6th abd. segment very short; specialised setae long, flagelliform; plaques small, round, devoid of microtrichia (chaetotaxy of mesothorax abnormal in 2nd instar) . . . 4.
 - 2nd instar: ventral setae (metathorax pair 2) long.
 - (a) Abd. VII, pair 1 short; pairs 2 and 3 long . . . (d).
 - (b) Mesothorax, pair 2, and Abd. IV pair 2, short
Aptinothrips rufus (Gmel.) Hal.
 - (c) Mesothorax, pair 2, and Abd. IV pair 2, long
Aptinothrips stylifer Tryb.
 - (d) Abd. VII, pair 1 long, pairs 2 and 3 short (mesothorax pair 2, long) . . . *Limothrips cerealium* Hal.
 - 1st instar: setae on 9th and 10th abd. segments very long . . . *A. rufus* and *A. stylifer*.
 4. Dorsal setae from head to 8th abd. segment very short; dorsal specialised setae (2nd instar only) short, fimbriate; plaques conspicuous, oblong, devoid of microtrichia (chaetotaxy of mesothorax normal in 2nd instar).
 - (a) 2nd instar: ventral setae; only }
metathorax, pair 2 long } *Anaphothrips obscurus* Müll.
 - 1st instar: only setae on 10th }
abd. segment very long }
 5. Integument unsclerotised.
 - (a) Setae from head to 5th abd. segment moderately long, blunt; plaques large, oval, inconspicuous
Chaetanaphothrips sp.
 - (b) Majority of setae very long, acute; plaques small, oblong, inconspicuous . . . *Scolothrips sexmaculatus* Perg.
- CC. Posterior margin of 9th abd. segment with processes THIRIPINAE (sens. str.).

2nd Instar.

1. Portion of 9th abd. segment sclerotised . . . 20.
2. Only 9th and 10th abd. segments partially sclerotised . . . 8.
3. Spiracles present on 2nd abd. segment; dorsal setae on 7th and 8th abd. segments long (over 40 μ).
4. 9th and 10th abd. segments brown, with some highly specialised setae; majority of setae long . . . 5.
 - (a) Processes on 9th abd. segment uniform dorsally; majority of setae penicilliform or blunt; plaques simple, inconspicuous
Kakothrips pisivorus West.
5. Posterior portions of 9th abd. segment grey; no setae highly specialised, the majority moderately long.
6. Processes on 9th abd. segment uniform dorsally . . . 7.
 - (a) Setae acute; dorsal plaques oval, the majority bearing a microtrichium . . . *Frankliniella intonsa* Tryb.
 - (b) Majority of setae blunt; dorsal plaques oblong, only bearing microtrichia in anterior portions of abd. segments
Thrips nigropilosus Uzel.
7. 9th abd. segment with 4 pairs of large processes of unequal size.
 - (a) Setae acute; plaques simple . . . *Taeniothrips inconsequens* Uzel.
8. Portions of head and/or thoracic segments also sclerotised.
9. Sclerotisation weak and limited . . . 17.
10. Majority of setae acute; processes on 9th abd. segment uniform dorsally. Plaques conspicuous, oblong.
11. Spiracles present on 2nd abd. segment. Dorsal setae on 7th and 8th abd. segments long (35–60 μ) . . . 16.

12. Dorsal plaques in anterior portions of segments bearing a microtrichium. 15.
13. Grey band on 9th abd. segment broad; setae on 9th and 10th abd. segments very long 14.
 - (a) 2-4 pairs grey spots on prothorax *Taeniothrips picipes* Zett.
14. Grey band on 9th abd. segment narrow; setae on 9th and 10th abd. segments moderately long.
 - (a) 1-2 pairs grey spots on prothorax *Taeniothrips vulgarissimus* Hal.
 - (b) 6-8 pairs grey spots on prothorax *Taeniothrips atratus* Hal.
15. Dorsal plaques devoid of microtrichia.
 - (a) Grey band on 9th abd. segment narrow; setae on 9th and 10th abd. segments moderately long (35-50 μ). 2-4 pairs grey spots on prothorax *Thrips physapus* L.
16. Spiracles on 2nd abd. segment wanting; dorsal setae on 7th and 8th abd. segments short (30-35 μ).
 - (a) Thoracic segments without spots; majority of plaques bearing a microtrichium *Thrips tabaci* L.
17. Sclerotisation strong and extensive.
18. Prothorax with masses of fused spots; setae acute; plaques inconspicuous 19.
 - (a) Dorsal setae on 7th and 8th abd. segments short (30-35 μ); dorsal processes on 9th abd. segment uniform; majority of plaques bearing a microtrichium *Thrips validus* Uzel.
 - (b) Dorsal setae on 7th and 8th abd. segments long (40-50 μ); dorsal processes on 9th abd. segment of unequal size, liable to fusion; majority of plaques simple *Thrips angusticeps* Uzel.
19. Grey spots on prothorax mostly separate; majority of setae blunt; dorsal plaques conspicuous.
 - (a) Dorsal setae on 7th and 8th abd. segments short (30-35 μ); dorsal processes on 9th abd. segment uniform; majority of plaques bearing a microtrichium *Thrips viminalis* Uzel.
20. Integument unsclerotised (except occasionally at apex of head only).
21. Spiracles present on 2nd abd. segment; dorsal processes on 9th abd. segment uniform.
22. Dorsal setae on 7th and 8th abd. segments short (30-35 μ) 25.
23. Setae acute 24.
 - (a) Dorsal plaques conspicuous, oblong, the majority bearing a microtrichium; ventral thoracic plaques simple *Thrips fuscipennis* Hal.
 - (b) All plaques minute, oval, bearing microtrichia both dorsally and ventrally *Thrips major* Uzel.
24. Majority of setae blunt.
 - (a) Plaques inconspicuous, bearing a microtrichium in anterior half of abd. segments *Thrips sambuci* Hal.
25. Dorsal setae on 7th and 8th abd. segments long (35-50 μ).
 - (a) Setae acute; plaques inconspicuous; bearing a microtrichium in anterior portion of abd. segments *Thrips flavus* Schr.

1st Instar.

1. Portions of integument sclerotised 14.
2. Greater portion of 9th and 10th abd. segments brownish-yellow; plaques conspicuous, simple 3.
 - (a) Processes on 9th abd. segment to 7 μ long; setae on 10th abd. segment 60-100 μ long *Kakothrips pisivorus* West.
3. 9th abd. segment posteriorly with a narrow grey band; dorsal plaques minute, the majority with a microtrichium.
4. Prothorax without grey spots 7.

5. Setae on 10th abd. segment 50–70 μ long 6.
 - (a) Processes on 9th abd. segment to 4 μ long; dorsal setae on 9th abd. segment knobbed *Frankliniella intonsa* Tryb.
 - (b) Processes on 9th abd. segment to 8 μ long; dorsal setae on 9th abd. segment sharply expanded *Taeniothrips inconsequens* Uzel.
6. Setae on 10th abd. segment 80–120 μ long.
 - (a) Processes on 9th abd. segment to 4 μ long; dorsal setae on 9th abd. segment blunt *Taeniothrips picipes* Zett.
7. Prothorax with grey spots.
8. One pair of small grey spots on prothorax (processes on 9th abd. segment to 4 μ long) 9.
 - (a) Setae on 10th abd. segment 35–50 μ long *Taeniothrips vulgarissimus* Hal.
 - (b) Setae on 10th abd. segment 30 μ long *Thrips tabaci* Lind.
9. Many grey spots or masses of spots on prothorax.
10. Majority of spots on prothorax separate; setae on 10th abd. segment 35–50 μ long 13.
11. Microtrichia on 9th abd. segment inconspicuous; majority of setae acute. 12.
 - (a) Processes on 9th abd. segment to 5 μ long *Taeniothrips atratus* Hal.
12. Microtrichia on 9th abd. segment long and conspicuous; majority of setae blunt.
 - (a) Processes on 9th abd. segment to 7 μ long *Thrips viminalis* Uzel.
13. Spots on prothorax fused into a mass on each side (majority of setae acute).
 - (a) Setae on 10th abd. segment 30 μ long *Thrips validus* Uzel.
 - (b) Setae on 10th abd. segment 35–40 μ long (Ahlberg 1924) *Thrips angusticeps* Uzel.
14. Integument unsclerotised (dorsal plaques minute, the majority with a microtrichium).
15. Setae on 10th abd. segment 30–35 μ long (majority of setae acute) 18.
16. Ventral plaques on thoracic segments simple 17.
 - (a) Dorsal setae on 9th abd. segment blunt; processes on 9th abd. segment to 3 μ long *Thrips physapus* L.
 - (b) Dorsal setae on 9th abd. segment acute; processes on 9th abd. segment to 5 μ long *Thrips fuscipennis* Hal.
17. Some ventral plaques on thoracic segments with a microtrichium.
 - (a) Dorsal setae on 9th abd. segment acute; processes on 9th abd. segment to 5 μ long *Thrips major* Uzel.
18. Setae on 10th abd. segment 35–50 μ long.
19. Ventral plaques on thoracic segments simple; processes on 9th abd. segment to 3 μ long.
20. (a) Majority of setae acute *Thrips flavus* Schr.
- (b) Majority of dorsal setae blunt *Thrips nigropilosus* Uzel.

IX. STRUCTURAL DESCRIPTIONS.

AEOLOTHRIPIDAE.

Mouth-cone short, not closely opposed to underside of the head. Antennae long and slender, 7-jointed; 3rd to 7th joints strongly and regularly annulate; 3rd, 4th, and 5th joints elongate, and about equal in length. Maxillary palpi 4-jointed (division between 2nd and 3rd joints often indistinct in 2nd instar). Labial palpi 3-jointed. Legs slender,

Aeolothrips fasciatus L.

2nd instar (figs. 11 and 12; antenna, fig. 2a; integument, fig. 44a).

Approximate dimensions: length 1.6 mm. Head, length 0.15 mm., breadth 0.14 mm. Antenna, length 0.3 mm. General colour: yellow to orange. Shape of head in ventral aspect, sub-circular (fig. 1a). Sclerotisation: in dorsal aspect; head at apex with an elongate grey area; prothorax with 4 pairs of rounded yellowish-grey spots, one pair laterally situated in the median, three pairs in the posterior portion; of the latter the

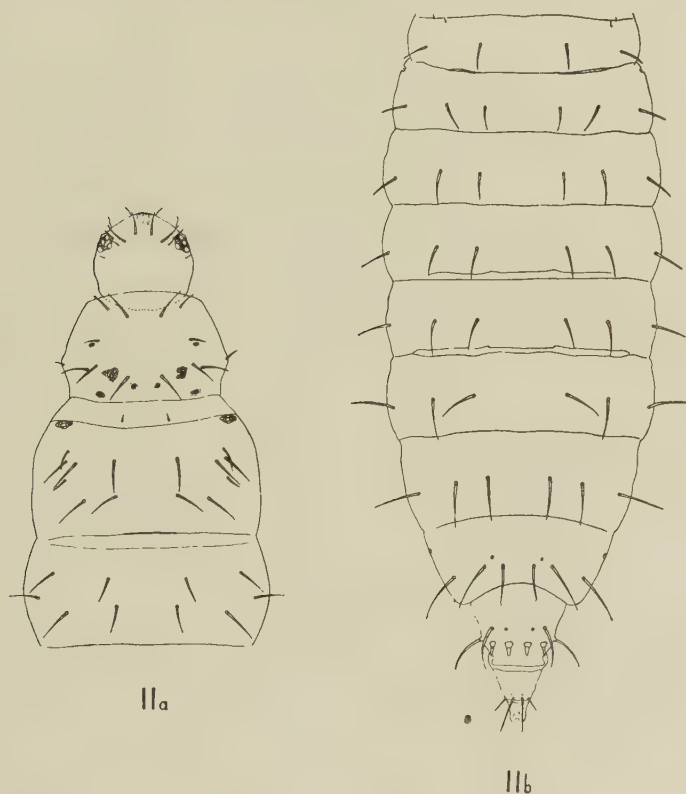


FIG. 11.—*Aeolothrips fasciatus* L. 2nd instar; dorsal aspect. $\times 90$. a, head and thoracic segments; b, abdominal segments.

median spots are bifid. Approximate number of antennal annulations: joint 3, 11; joint 4, 10; joint 5, 12; joint 6, 4; joint 7, 6. Integumental structures: 9th abdominal segment dorsally with a transverse row of 4 processes, each about $25\ \mu$ long and raised upon a tubercle. Integument of thorax and abdomen (fig. 44a) closely beset with microtrichia. 3rd to 7th antennal joints, femora and tibiae (see fig. 3a) with rings of microtrichia. 4th antennal joint distally with two trichomes. Spiracles: peritremes of 2nd and 8th abdominal segments small (about $5\ \mu$ diameter), the former marginal in position. Pori: a pair dorsally upon the 8th, 9th, and 10th abdominal segments. Chaetotaxy: apices of setae acute (see fig. 4a). Pairs 1 and 4 upon the head in dorsal aspect anterior to the level of the eyes. Accessory pair "k" on 9th abdominal segment wanting.

Length of setae in μ Pair no.	Dorsal aspect							Ventral aspect			
	1	2	3	4	5	6	7	1	2	3	4
Head . . .	35	30	15	15	5			45	35	30	25
Prothorax . . .	40	45	30	30	50	35	50				
Mesothorax . . .	45	50	30	50	50	25		25	55	35	
Metathorax . . .	45	35	40	45	50			25	55	35	
Abdomen I . . .	40	45									
" II . . .	35	45	45					30	—		
" III . . .	40	50	45					30	30	25	
" IV . . .	40	50	50					30	30	35	
" V . . .	45	50	50					30	40	45	
" VI . . .	50	55	55					40	45	50	
" VII . . .	55	65	60					50	65	55	
" VIII . . .	60	70	65					55	65	60	
" IX . . .	65	60	k —					65	—	—	
" X . . .	55	25						35	45		

1st instar (fig. 13 : head, fig. 1a; antenna, fig. 2b, leg, fig. 3a; integument, fig. 44b).

Differs from 2nd instar as follows :—

Sclerotisation : grey area at apex of head wanting; greater portion of prothorax in

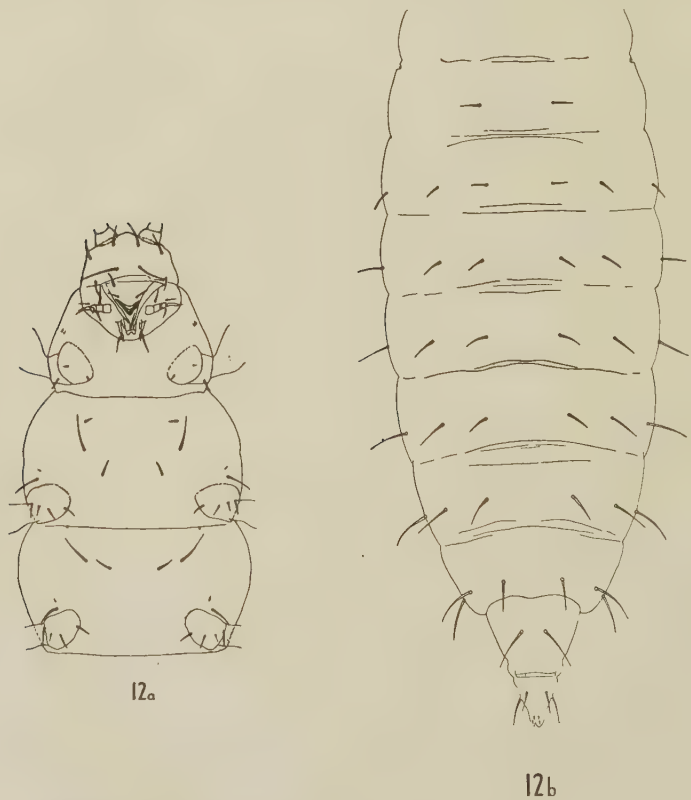


FIG. 12.—*Aeolothrips fasciatus* L. 2nd instar; ventral aspect. $\times 90$. a, head and thoracic segments; b, abdominal segments.

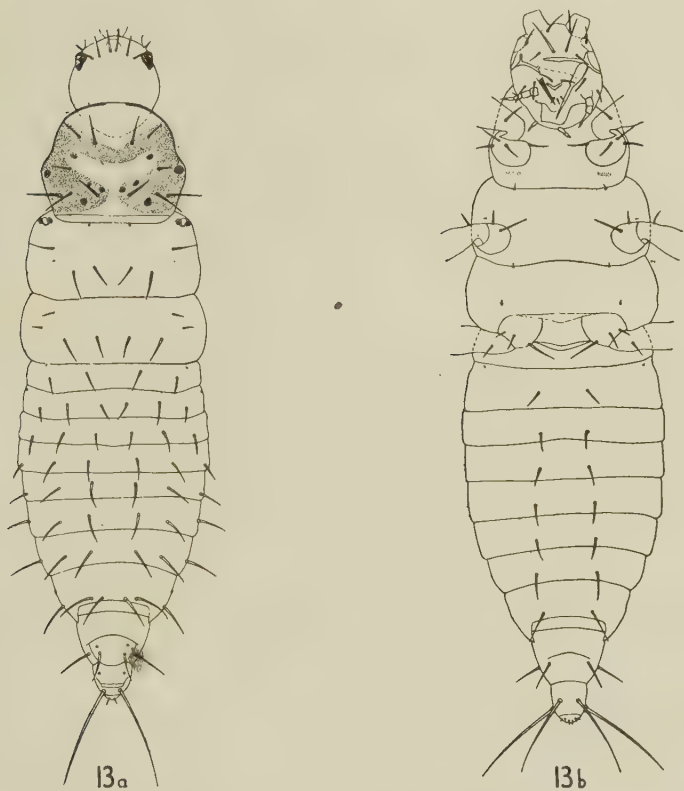


FIG. 13.—*Aeolothrips fasciatus* L. 1st instar. $\times 90$. a, dorsal aspect; b, ventral aspect.

dorsal aspect grey, its anterior margin dark; 5 pairs of rounded grey spots, two in the median, three in the posterior portion. Integumental structures: processes on 9th abdominal segment wanting. 2nd antennal joint with a single ring of microtrichia. Pori: the pair upon the 8th abdominal segment wanting. Chaetotaxy: setae upon 6th to 9th abdominal segments shorter, upon 10th segment much longer. Longest setae on meso- and metathoracic coxae and upon underside of 2nd antennal joint 30–35 μ long.

Length of setae in μ	Dorsal aspect							Ventral aspect			
Pair no.	1	2	3	4	5	6	7	1	2	3	4
Head . . .	30	30	15	15				55	35	25	25
Prothorax . .	35	40	25	20	50						
Mesothorax . .	35			35		10	40				
Metathorax . .	30		15	15	35						
Abdomen I . .	30	25									
" II . .	25	30	25					25			
" III . .	25	30	25					25			
" IV . .	30	30	30					25			
" V . .	35	35	35					30			
" VI . .	35	40	40					30			
" VII . .	50	45	50					40			
" VIII . .	50	50	50					45			
" IX . .	40	50						40	50		
" X . .	135	—						120	155		

Source of material :—Cornwall, July 1932, flowers of burdock; Hertfordshire, July 1931 and 1932, flowers of dandelion and lupin; August 1931, chenopodium; October 1934, grass.

THRIPIDAE.

Mouth-cone closely opposed to underside of head, and prolonged at least to region of prothoracic coxae. Only 3rd and 4th antennal joints distinctly annulate; 5th joint always much shorter than 4th. Maxillary palpi 3-jointed (sometimes apparently 4-, or 2-jointed); labial palpi 2-jointed (proximal joint very short). Legs comparatively short and stout, their integument devoid of microtrichia.

HELIOTHRIPINAE.

Head, in ventral aspect, elongate-ovate. Antennae very long, 7-jointed, the terminal joint hastate, and sub-divided twice or thrice; 4th joint with two distally placed trichomes. Setae upon 10th abdominal segment very short. (Chaetotaxy of thoracic segments abnormal in 2nd instar.)

Heliothrips haemorrhoidalis Bouché.

2nd instar (fig. 14; head, fig. 1b; antenna, fig. 2c; leg, fig. 3b; integument, fig. 44c).

Approximate dimensions: length 1·4 mm. Head, length 0·24 mm., breadth 0·16 mm. Antenna, length 0·38 mm. General colour: white to yellow. 11th abdominal segment expanded posteriorly. Sclerotisation: in dorsal aspect, head with a triangular grey area anterior, and a smaller area posterior to each eye. Posterior two-thirds of 9th abdominal segment grey, the sclerotisation extending ventrally only as far as the region of the ventro-lateral seta-insertions; posterior two-thirds of 10th abdominal segment grey. Approximate number of antennal annulations, on joint 3, 5; joint 4, 5; joint 5, 2 (indefinite); joint 6, 3 (indefinite). Integumental structures: posterior rim of 11th abdominal segment with 3 pairs of hyaline filamentous processes, 30 μ –60 μ long. Integument of thoracic and abdominal segments beset with regular rings of elongate carinate plaques, devoid of microtrichia. Seams of antennal joints devoid of microtrichia. Spiracles: peritremes of 2nd abdominal segment wanting; those of 8th abdominal segment conspicuous, each 20 μ in diameter. Pori: a pair dorsally upon the 8th, as well as each of the 9th and 10th abdominal segments. Chaetotaxy: majority of setae very short; their apices blunt upon the dorsal surface, the 2nd and 3rd antennal joints, and the femora and tibiae of the legs. Setae of pair 3 upon both the meso- and metathorax in dorsal aspect are wanting.

Length of setae in μ Pair no.	Dorsal aspect							Ventral aspect			
	1	2	3	4	5	6	7	1	2	3	4
Head	10	20	25	20	5			20	20	15	15
Prothorax	15	10	10	10	10	30	15				
Mesothorax	10	10	—	10	10	5	10	15	10	20	
Metathorax	10	10	—	15	10			10	10	15	
Abdomen I	5	15									
" II	10	10	15					15	15		
" III	10	10	15					15	10	15	
" IV	10	10	15					15	10	15	
" V	10	10	15					15	10	15	
" VI	15	10	20					15	15	15	
" VII	15	15	20					25	15	15	
" VIII	15	20	30					25	15	15	
" IX	10	30	k 20					40	45		
" X	5	—						5	5		

1st instar.

Differs from 2nd instar as follows :—

Sclerotisation : less strong. Pori on 8th abdominal segment wanting. Chaetotaxy : setae very short, ranging from 5μ – 15μ in length, with the exception of those of pair 1 upon the 9th abdominal segment in ventral aspect, 35μ , and of a seta situated upon the

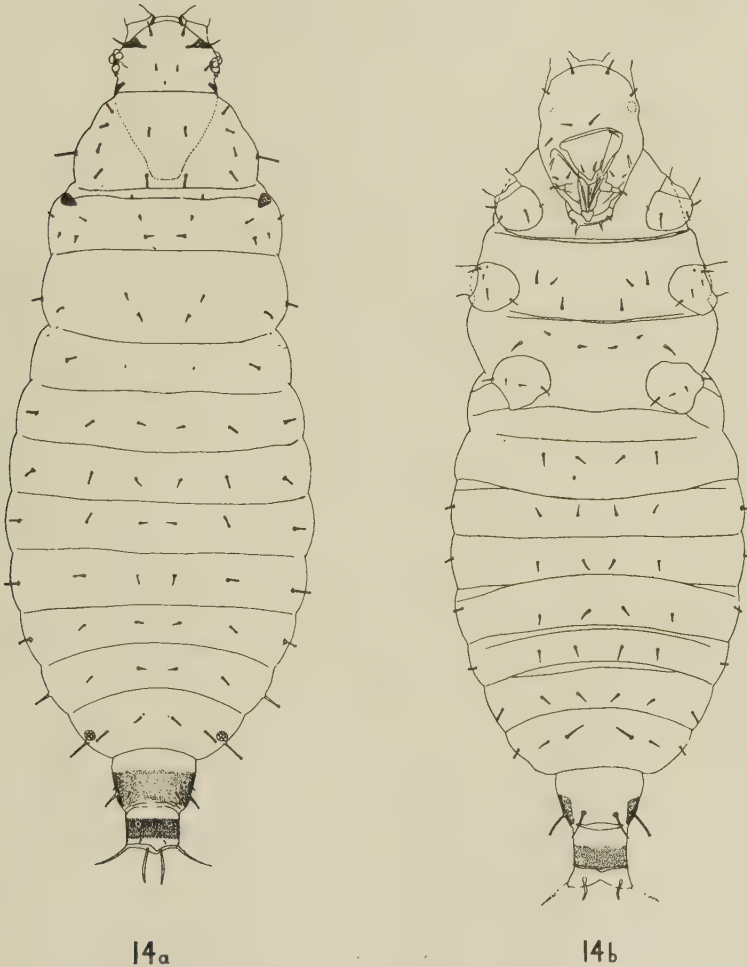


FIG. 14.—*Heliothrips haemorrhoidalis* Bouché. 2nd instar. $\times 90$. a, dorsal aspect; b, ventral aspect.

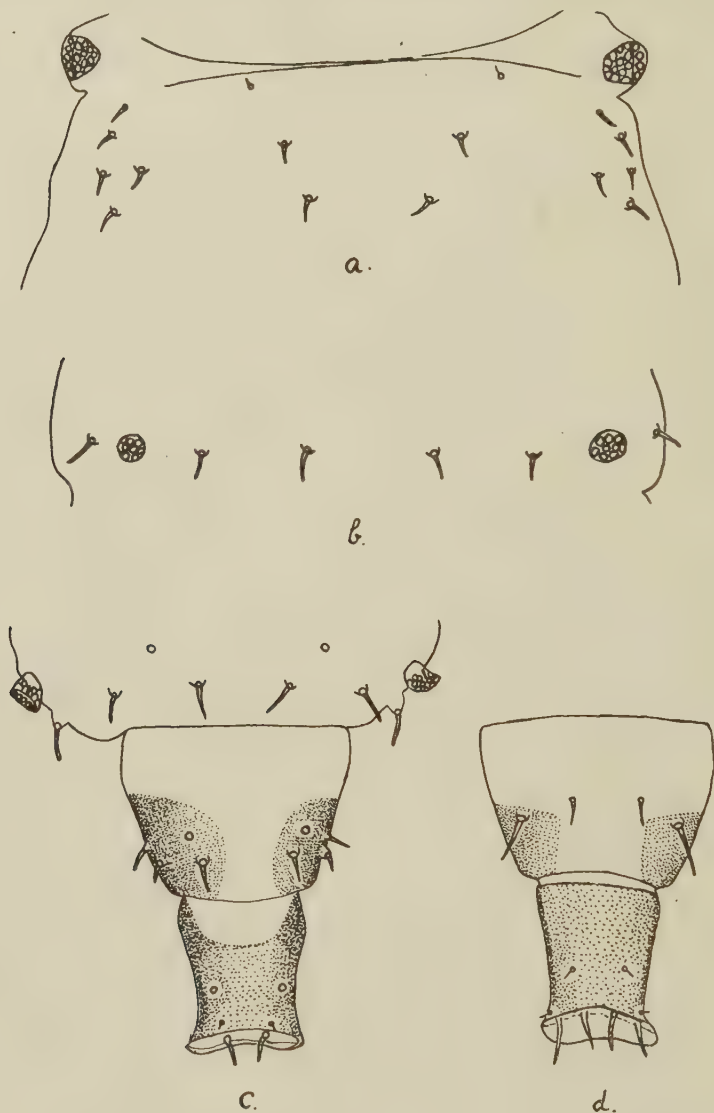
upper surface of the trochanter of each prothoracic leg, 20μ . Longest setae on meso- and metathoracic coxae and upon underside of 2nd antennal joint hardly exceed 10μ in length.

Source of material : North Devon, February 1939, on cyclamen under glass. Worcestershire, August 1938, on grape-vine under glass.

Hercinothrips femoralis Reuter.

2nd instar (fig. 15; integument, fig. 44d).

Approximate dimensions: length 1.0 mm. Head, length 0.23 mm., breadth 0.15 mm. Antenna, length 0.33 mm. General colour: yellow. 11th abdominal segment cylindrical. Sclerotisation: posterior half of 9th, except mid-dorsally and mid-ventrally, and almost the whole of 10th abdominal segment, brownish-yellow. Approximate number of antennal



15

FIG. 15.—*Hercinothrips femoralis* Reuter. 2nd instar. $\times 230$. a, mesothorax, dorsal aspect; b, 2nd abdominal segment, dorsal aspect; c, 8th-11th abdominal segments, dorsal aspect; d, 9th-11th abdominal segments, ventral aspect.

annulations, upon joint 3, 5; joint 4, 5; joint 5, 4 (indefinite); joint 6, 3 (indefinite). Integumental structures: posterior rim of 11th abdominal segment with 3 pairs of short hyaline filamentous processes, each about 20 μ in length. Integument of thoracic and abdominal segments beset with irregular rings of oval plaques, many of which bear a microtrichium. Seams of antennal joints devoid of microtrichia. Spiracles: peritremes raised upon prominent tubercles; those of 2nd and 8th abdominal segments about 20 μ in diameter. Pori: a pair dorsally upon the 8th as well as each of the 9th and 10th abdominal segments. Chaetotaxy: all setae very short, the majority of those upon dorsal surface rather stout, and raised upon tubercles, their apices penicilliform (fig. 4g); similar setae occur also upon the 2nd and 3rd antennal joints, and upon the femora and tibiae of the legs. The setae of pair 3 upon the metathorax in dorsal aspect are wanting.

Length of setae in μ Pair no.	Dorsal aspect							Ventral aspect			
	1	2	3	4	5	6	7	1	2	3	4
Head . . .	10	10	10	10	5			15	25	10	10
Prothorax . . .	10	10	10	10	10	15	10				
Mesothorax . . .	15	10	10	10	10	10	15	15	15	20	
Metathorax . . .	15	15	—	10	15			15	15	15	
Abdomen I . . .	5	10									
„ II . . .	15	15	15					20	15		
„ III . . .	15	15	15					25	15	15	
„ IV . . .	15	15	15					25	15	15	
„ V . . .	15	15	15					25	20	15	
„ VI . . .	15	20	20					25	20	15	
„ VII . . .	15	25	20					20	15	15	
„ VIII . . .	20	15	20					20	15	15	
„ IX . . .	10	15	k15					15	30		
„ X . . .	5	—						5	5		

1st instar.

Differs from 2nd instar as follows:—

Processes on 11th abdominal segment shorter, about 15 μ in length. Sclerotisation: integument of 9th and 10th abdominal segments unsclerotised. Pori: pair upon 8th abdominal segment wanting. Chaetotaxy: no setae exceed 15 μ in length.

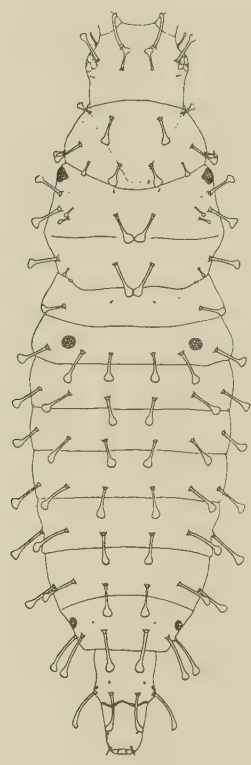
Source of material: Hertfordshire, April 1929 and October 1932; on crinum under glass.

Parthenothrips dracaenae Heeger.

2nd instar (figs. 16 and 17; integument, fig. 44e).

Approximate dimensions: length 1.4 mm. Head, length 0.23 mm., breadth 0.15 mm. Antenna, length 0.37 mm. General colour: white to pale yellow. Sclerotisation: integument of body divisions unsclerotised. Approximate number of antennal annulations, upon joint 3, 5; joint 4, 6; joint 5, 3 (indefinite); joint 6, 3 (indefinite). Integumental structures: integument of thoracic and abdominal segments sparsely and very irregularly beset with indistinct rounded plaques of variable size and devoid of microtrichia. Inconspicuous microtrichia are present upon one or two distal seams of the 3rd antennal joint. Spiracles: peritremes of 2nd and 8th abdominal segment each about 20 μ in diameter. Pori: a pair dorsally upon the 8th as well as each of the 9th and 10th abdominal segments. Chaetotaxy: majority of dorsal setae moderately long to long, their apices sharply expanded and crateriform (fig. 4, i and l), their alveoli raised upon conical protuberances; in ventral aspect, only those of pair 3 upon each of the 4th to 8th abdominal segments,

and pair 2 upon the 9th abdominal segment have crateriform apices; similarly specialised, but short setae occur upon the 2nd and 3rd antennal joints, and upon the femora and



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FIG. 16.—*Parthenothrips dracaenae* Heeger. 2nd instar; dorsal aspect. $\times 90$.

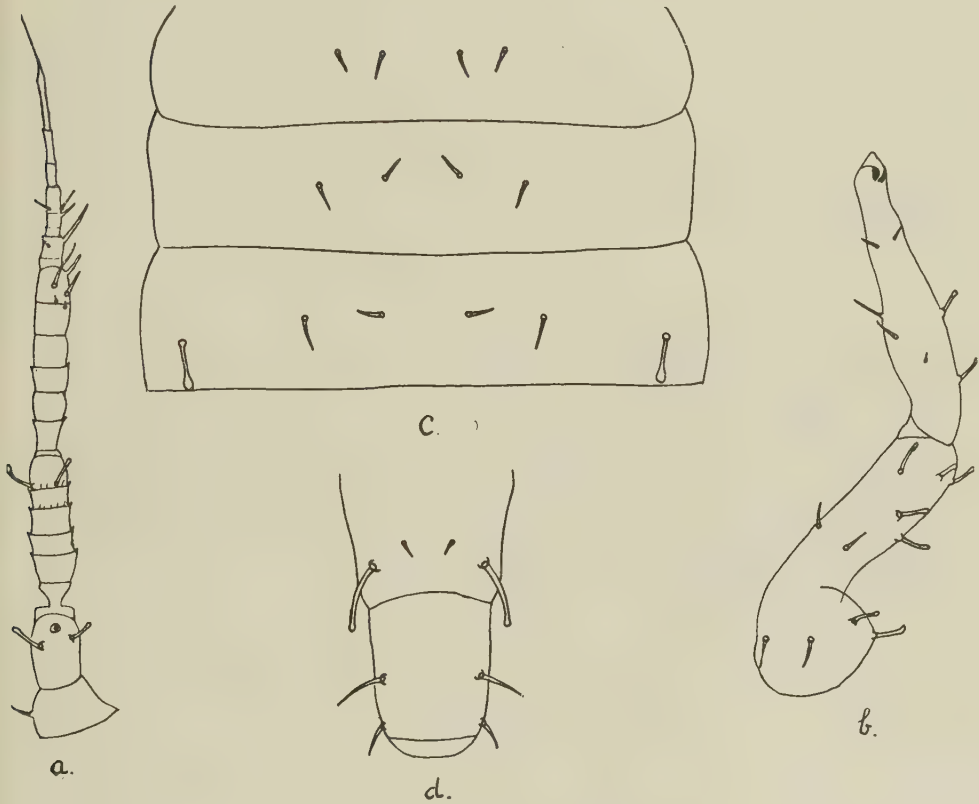
tibiae of the legs. Setae of the following pairs, in dorsal aspect, are wanting; prothorax, pair 4; mesothorax, pair 2 and sometimes also pair 3; metathorax, pairs 2 and 3.

Length of setae in μ	Pair no.	Dorsal aspect							Ventral aspect			
		1	2	3	4	5	6	7	1	2	3	4
Head . . .	30	50	25	45	10				20	25	30	20
Prothorax . . .	30	35	15	—	45	20	20		15	15	10	
Mesothorax . . .	40	—	5	45	20	45	15		10	10	15	
Metathorax . . .	45	—	—	40	15							
Abdomen I . . .	5	40										
„ II . . .	35	45	45						15	15		
„ III . . .	40	45	45						15	15	—	
„ IV . . .	40	45	45						15	15	25	
„ V . . .	40	45	45						15	15	25	
„ VI . . .	45	50	45						15	20	25	
„ VII . . .	45	55	50						15	20	25	
„ VIII . . .	50	60	50						15	20	25	
„ IX . . .	50	55	k10						15	35		
„ X . . .	10	—							25	15		

1st instar.

Differs from 2nd instar as follows :—

Pori: pair upon the 8th abdominal segment wanting. Chaetotaxy: dorsal setae with crateriform apices as in 2nd instar, with the exception of those in the position of pair 7 upon both pro- and mesothorax, of pair 5 upon metathorax, and pair 1 upon each



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FIG. 17.—*Parthenothrips dracaenae* Heeger. 2nd instar. $\times 230$. a, antenna (right side); b, prothoracic leg (right side); c, 2nd-4th abdominal segments, ventral aspect; d, 9th-11th abdominal segments, ventral aspect.

of the 1st and 10th abdominal segments; in ventral aspect no setae are specialised. The setae of pair 4 upon the prothorax, and pair 3 upon the metathorax in dorsal aspect are wanting. Longest setae on meso- and metathoracic coxae, and upon underside of 2nd antennal joint, 10μ .

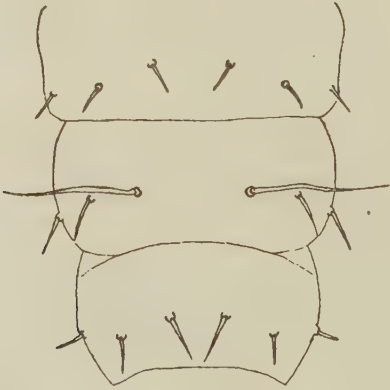
Length of setae in μ Pair no.	Dorsal aspect							Ventral aspect			
	1	2	3	4	5	6	7	1	2	3	4
Head . . .	15	25	10	30				10	15	15	10
Prothorax . .	20	20	10	—	30		5				
Mesothorax . .	20			20		25	5				
Metathorax . .	25		—	20	5						
Abdomen I . .	5	15									
„ II-IV . .	15	20	15					5			
„ III . .	15	20	15					5			
„ IV . .	15	20	15					5			
„ V . .	20	25	15					5			
„ V-VI . .	20	25	15					5			
„ VII . .	25	30	15					5			
„ VIII . .	30	35	20					5			
„ IX . .	40	50						—	10		
„ X . .	5	—						10	5		

Source of material : Hertfordshire, July 1931, on stephanotis under glass.

CHIROTHRIPINAE.

Limothrips and *Aptinothrips*.

Head, in ventral aspect, narrowly ovate, the lateral margins sinuate (fig. 1e). Antennae short, 6-jointed; 3rd joint dilated and truncate distally; 3rd and 4th joint, broadly annulate; 5th and 6th joints each much shorter than the 4th; 6th joint rounded apically. 4th joint with three distally situated trichomes. Integument of thorax and abdomen (fig. 45c, d) beset with small rounded plaques devoid of microtrichia. Peritremes of spiracles upon the 2nd and 8th abdominal segments small (7-10 μ diameter). Posterior margin of 9th abdominal segment devoid of processes. Dorsal setae upon head, thoracic, and first five abdominal segments very short; long setae occur ventrally upon the thorax and abdomen (figs. 4b and 18), and laterally upon the 7th and 9th abdominal segments. Chaetotaxy of mesothorax abnormal in 2nd instar.



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FIG. 18.—*Limothrips cerealium* Haliday. 2nd instar. $\times$ 230. 6th-8th abdominal segments, ventral aspect.

Limothrips cerealium Haliday.

2nd instar (fig. 18; integument, fig. 45c).

Approximate dimensions: length 1.2 mm. Head, length 0.2 mm., breadth 0.1 mm. Antenna, length 0.15 mm. General colour: yellow. Sclerotisation: in dorsal aspect, head at apex with a brownish-yellow sub-quadrangular area; lateral regions, including the eyes, brownish or greyish-yellow, leaving a light area medianly; prothorax with a mass of grey spots to each side; mesothorax with a pair of oval grey spots at the anterior margin, and posteriorly with a pair of smaller areas each composed of 2 or 3 rounded grey spots; metathorax sometimes with one pair of small spots. Posterior portion of 9th abdominal segment, including the region of the setae, but not that of the pori, yellowish-grey; greater portion of 10th abdominal segment, both dorsally and ventrally, brownish or greyish-yellow. Approximate number of antennal annulations, joint 3, 4 in median portion; joint 4, 6. Integumental structures: see under genus; seams of 4th antennal joint beset with short microtrichia. Pori: a pair dorsally upon the 8th as well as the 9th and 10th abdominal segments. Chaetotaxy: long flagelliform setae are distributed as follows: in ventral aspect, mesothorax, pair 2; metathorax, pair 2; 7th abdominal segment, pair 1 (fig. 18); 10th abdominal segment, pairs 1 and 2. Setae in the position of pair 3 dorsally upon the mesothorax are wanting.

Length of setae in μ Pair no.	Dorsal aspect							Ventral aspect			
	1	2	3	4	5	6	7	1	2	3	4
Head	10	10	5	10	10			20	20	5	5
Prothorax	10	5	5	5	5	10					
Mesothorax	10	5	—	5	5	5	10	10	60	5	
Metathorax	10	5	5	5	10			10	60	—	
Abdomen I-VI				5-15					10-15		
" VII	20	25	45					65	35	25	
" VIII	20	25	30					25	20	15	
" IX	15	45	k 10					10	40		
" X	40	15						65	45		

Source of material: Northumberland, September 1934, in ears of barley.

1st instar.

No material available.

Aptinothrips rufus (Gmel.) Haliday.

2nd instar (fig. 19; head, fig. 1e; antenna, fig. 2d; integument, fig. 45d; see also Speyer 1935, figs. 19-26).

Approximate dimensions: length 0.9 mm. Head, length 0.17 mm., breadth 0.08 mm. Antenna, length 0.15 mm. General colour: pale to orange yellow, portions of 9th and 10th abdominal segments brownish-yellow in specimens collected from halophytic plants. Sclerotisation: in dorsal aspect, head at apex with a greyish-yellow sub-quadrangular area; lateral regions, including eyes, grey, with a pair of darker rounded spots near the posterior margin; prothorax with a mass of grey spots to each side; mesothorax with a pair of small rounded grey spots near the anterior margin, and a larger oval pair pos-

teriorly; metathorax with a single pair of grey spots. Presence or absence of spots upon meso- and metathorax is variable. Greater portion of 9th and 10th abdominal segments yellowish-grey to brownish-yellow. Approximate number of antennal annulations, joint 3, 4 in median portion; joint 4, 6. Integumental structures: see under genus. Only the proximal seam of 3rd antennal joint beset with microtrichia. Pori: a pair dorsally upon

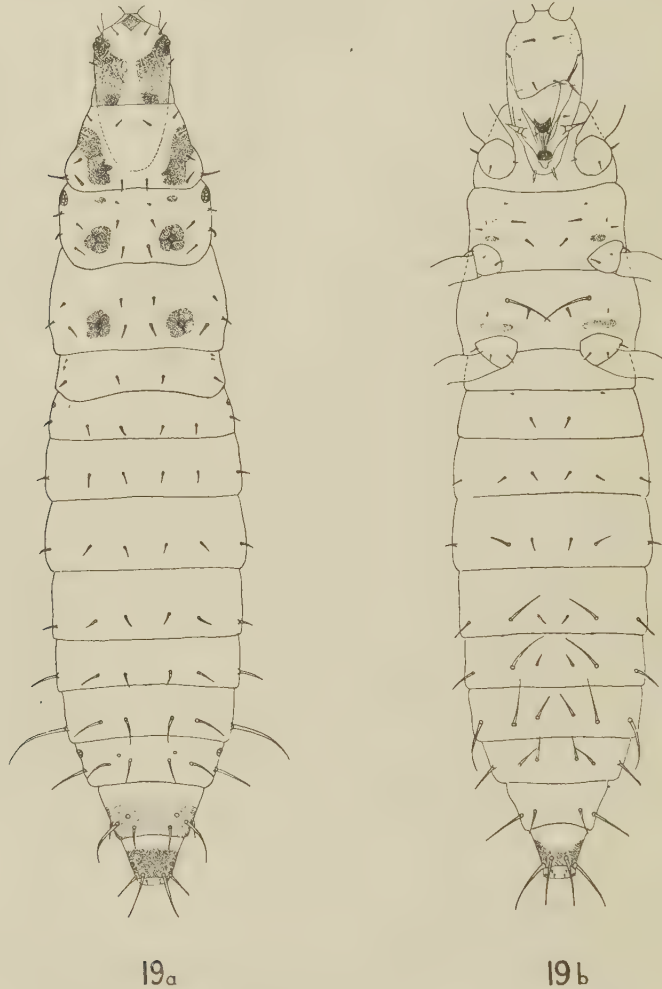


FIG. 19.—*Aptinothrips rufus* (Gmel.) Haliday. 2nd instar. $\times 120$. a, dorsal aspect; b, ventral aspect.

the 8th as well as the 9th and 10th abdominal segments. Chaetotaxy: long flagelliform setae are distributed as follows: in dorsal aspect, 7th abdominal segment, pair 3; 9th abdominal segment, pair 2; 10th abdominal segment, pair 1; in ventral aspect, metathorax, pair 2; 5th and 6th abdominal segments, pair 2; 7th abdominal segment, pairs 2 and 3; 9th abdominal segment, pair 2; 10th abdominal segment, pairs 1 and 2. Setae in the position of pair 3 dorsally upon the mesothorax are wanting.

Length of setae in μ Pair no.	Dorsal aspect							Ventral aspect			
	1	2	3	4	5	6	7	1	2	3	4
Head . . .	10	15	10	10	5			15	15	5	5
Prothorax . . .	15	10	10	5	10	15	15				
Mesothorax . . .	15	10	—	10	10	10	15	15	15	10	
Metathorax . . .	15	10	5	10	15			10	55	—	
Abdomen I . . .	5	10									
" II . . .	10	15	10					10	—		
" III . . .	10	10	15					10	10	10	
" IV . . .	10	15	15					10	20	15	
" V . . .	10	15	15					10	40	25	
" VI . . .	15	15	30					15	50	35	
" VII . . .	30	30	70					30	50	55	
" VIII . . .	25	30	40					20	25	25	
" IX . . .	30	55	k 25					20	45		
" X . . .	45	25						55	50		

1st instar (see also Speyer 1935, 1936, and 1938).

Differs from 2nd instar in the absence of the sclerotised area at the apex of the head, and of pori upon the 8th abdominal segment. Chaetotaxy: number of pairs of setae normal for the instar. In dorsal aspect, setae upon the head, thoracic and first five abdominal segments 5–10 μ long; in ventral aspect, setae 5–10 μ long except pair 1 upon the head, 30 μ . Longest setae upon meso- and metathoracic coxae and on underside of 2nd antennal joint 35–45 μ .

Length of setae in μ Pair no.	Dorsal aspect			Ventral aspect	
	1	2	3	1	2
Abdomen VI . . .	10	10	10	15	
" VII . . .	20	20	70	25	
" VIII . . .	15	15	25	20	
" IX . . .	20	80		35	
" X . . .	75	30		65	70

Source of material: England and Scotland, throughout the year on various grasses, collected mostly by Dr. G. Morison. Finland, a few specimens collected by Dr. Hukkinen. New Zealand, a single 1st instar larva, presumably of this species, collected by Mr. G. A. Helson.

Aptinothrips stylifer Trybom.

2nd instar (for illustrations see Speyer 1935, figs. 27 and 28).

Approximate dimensions: length 0.86 mm. Head, length 0.17 mm., breadth 0.08 mm. Antenna, length 0.1 mm. General colour: white to pale yellow. Differs from *A. rufus* in less strongly sclerotised areas, and in the chaetotaxy. Chaetotaxy: long flagelliform setae occur in ventral aspect upon the mesothorax in the position of pair 2 as well as upon the metathorax, and upon the 4th as well as the 5th and 6th abdominal segments.

Length of setae in μ Pair no.	Dorsal aspect							Ventral aspect			
	1	2	3	4	5	6	7	1	2	3	4
Head . . .								25	20	5	5
Prothorax . .											
Mesothorax . .								15	40	10	
Metathorax . .								10	45	—	
Abdomen I . .				5-15							
" II . .										10-15	
" III . .											
" IV . .								15	45	15	
" V . .								15	45	20	
" VI . .	10	10	20					15	35	25	
" VII . .	30	30	60					15	45	55	
" VIII . .	25	25	30					20	25	25	
" IX . .	20	45	k 20					20	40		
" X . .	45	25						50	45		

1st instar.

Not separable from that of *A. rufus*.

Source of material: large numbers of larvae from various localities in Finland on grasses, collected by Dr. Hukkinen, and many collected by Dr. G. D. Morison during the summer months in Aberdeenshire, Scotland, on various grasses.

SERICOTHRIPINAE.

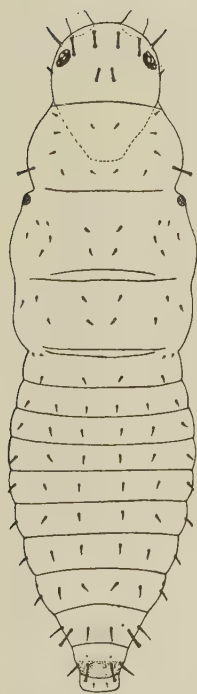
Antennae short; 6-jointed; 3rd joint expanding gradually from base to distal third; 5th and 6th joints each much shorter than the 4th; 4th joint with 3 distally situated trichomes. Posterior margin of 9th abdominal segment devoid of processes. Dorsal setae upon thoracic and first eight abdominal segments very short; no pair or pairs of setae upon the 7th abdominal segment conspicuously longer than other setae upon that segment.

Scirtothrips longipennis Bagnall.

2nd instar (fig. 20; head, fig. 1d; antenna, fig. 2e; leg, fig. 3d; integument, fig. 45a).

Approximate dimensions: length 0.7 mm. Head, length 0.14 mm., breadth 0.1 mm. Antenna, length 0.15 mm. General colour: white to pink or light red. Head in ventral aspect broadly ovate. Sclerotisation: only setae upon the dorsal surface of thoracic and abdominal segments surrounded by grey circles. Integumental structures: integument beset with minute dot-like plaques which are dark dorsally and laterally from the mesothorax to the 8th abdominal segment, and become light ventrally; the majority of plaques bear a very short and inconspicuous microtrichium. Approximate number of antennal annulations, upon joint 3, 5; joint 4, 7. Microtrichia upon seams of 4th joint comparatively long; trichomes very long. Spiracles: wanting upon 2nd abdominal segment; peritremes of 8th abdominal segment very small (5 μ diameter). Pori: single pairs dorsally upon the 9th and 10th abdominal segments only. Chaetotaxy: majority of setae upon the head of moderate length. Spoon-shaped or knobbed setae (fig. 4e) occur dorsally upon the head (pairs 1, 2, and 4), the prothorax (pair 6), 9th abdominal segment (pair 2), 10th abdominal segment (pair 1), upon the 2nd antennal joint and femora and tibiae of the legs.

Length of setae in μ Pair no.	Dorsal aspect							Ventral aspect			
	1	2	3	4	5	6	7	1	2	3	4
Head . . .	15	20	25	25	10			15	25	20	15
Prothorax . . .	10	10	10	10	10	20	10				
Meso- and meta- thorax and abdo- men I-VIII . .				5-10					10-15		
Abdomen IX . .	15	20	k 25					15	25		
„ X . .	20	15						25	20		



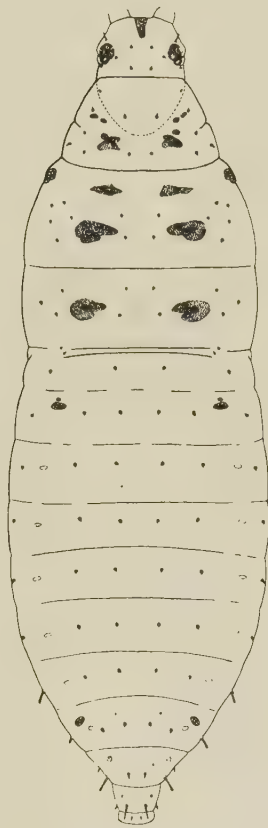
20a



20b

FIG. 20.—*Scirtothrips longipennis* Bagnall.
2nd instar. $\times 120$. a, dorsal aspect;
b, ventral aspect.

1st instar.



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FIG. 21.—*Dendrothrips degeeri*
Uzel. 2nd instar, dorsal
aspect. $\times 120$.

Differs from 2nd instar in absence of grey circles surrounding basis of setae; dot-like integumental plaques hyaline both dorsally and ventrally. Chaetotaxy: setae 5-15 μ

long. Knobbed setae are present also upon the 3rd antennal joint. Longest setae upon meso- and metathoracic coxae $10\ \mu$, upon underside of 2nd antennal joint $20\ \mu$.

Source of material: Surrey, October 1934, in flowers of cyclamen grown under glass.

Dendrothrips degeeri Uzel.

2nd instar (fig. 21; head, fig. 1c; integument, fig. 45b).

Approximate dimensions: length 1.0 mm. Head, length 0.15 mm., breadth 0.11 mm. Antenna, length 0.18 mm. General colour: 'yellow. Head in ventral aspect oval. Sclerotisation: in dorsal aspect, head with a sub-triangular greyish-yellow area apically; prothorax with 2 pairs of grey spots laterally near the anterior margin, and a pair of clusters of about 6 grey spots in the median region; mesothorax with a pair of conspicuous grey areas of triangular shape near the anterior margin, and a large yellowish-grey pair posteriorly; metathorax with one pair similar to the latter; upon each of the 3rd to 9th abdominal segments a pair of small oval grey spots to each side; in ventral aspect, a pair of grey spots posterior to the prothoracic coxae. Dorsal setae of thoracic and first eight abdominal segments surrounded by small grey circles. Approximate number of antennal annulations, joint 3, 4; joint 4, 7. Integumental structures: integument of thoracic and first nine abdominal segments beset with minute rounded plaques, some of which become more oblong dorsally upon the more posterior segments; upon the abdominal segments dorsally the plaques are dark, and then extend round the sides for some distance on to the ventral surface, where they are replaced by light plaques. The plaques throughout are devoid of microtrichia. Microtrichia upon the seams of the 4th antennal joint short. Trichomes short. Spiracles: a small accessory peritreme is placed anterior to the spiracle of either side upon the 2nd abdominal segment; peritremes of the latter and of the 8th abdominal segment about $15\ \mu$ in diameter. Pori: a pair dorsally upon the 8th as well as each of the 9th and 10th abdominal segments. Chaetotaxy: all setae very short. Specialised setae with fimbrillate apices are situated dorsally in the position of pair 3 on each of the 6th to 8th, of pair 2 upon the 9th and pair 1 upon the 10th abdominal segments. The setae of pair 3 upon the mesothorax in ventral aspect are wanting.

Length of setae in μ	Pair no.	Dorsal aspect							Ventral aspect			
		1	2	3	4	5	6	7	1	2	3	4
Head . . .		5	5	10	5	5			15	15	5	15
Prothorax . .		5	5	>5	5	5	5	5				
Mesothorax . .		5	5	5	5	5	5	5	10	10	—	
Metathorax . .		5	5	5	5	5			10	10	—	
Abdomen I . .		5	5									
„ II . . .		5	5	5					5	—		
„ III . . .		5	5	5					5	—	5	
„ IV-VIII . .					5-15						5-10	
„ IX . . .		5	20	k 5					10	15		
„ X . . .		15	5						15	15		

Source of material: Surrey (Boxhill), July 1915, on fraxinus; collected by Dr. C. B. Williams.

1st instar.

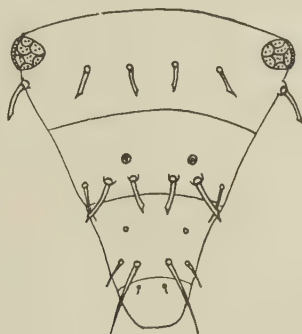
No material available.

Anaphothrips obscurus Müller.

2nd instar (fig. 22; integument, fig. 45e).

Approximate dimensions: Length 1.2 mm. Head, length 0.12 mm., breadth 0.11 mm.,

Antenna, length 0.17 mm. General colour: pale yellow. Head in ventral aspect rather broadly ovate. Sclerotisation: in dorsal aspect, head with an oblong grey area apically, and a pair of grey spots, each placed laterally anterior to the eye; posterior margin of 9th abdominal segment with a narrow grey band, not extending to the median seta-insertions; posterior portion of 10th abdominal segment grey. Approximate number of antennal annulations, on joint 3, 4; joint 4, 7. Integumental structures: integument of thoracic and first eight abdominal segments beset with prominent oblong plaques, with dark margins, but devoid of microtrichia; dorsal plaques upon the 9th abdominal segment



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FIG. 22.—*Anaphothrips obscurus* Müller. 2nd instar. $\times 230$. 8th–11th abdominal segments, dorsal aspect.

increasing in size towards the posterior margin. Microtrichia on seams of 4th antennal joint conspicuous; trichomes of moderate length. Spiracles: peritremes of 2nd abdominal segment very conspicuous, about $28 \mu \times 14 \mu$; those of 8th abdominal segment about 15μ in diameter. Pori: a pair dorsally on each of the 9th and 10th abdominal segments. Chaetotaxy: majority of setae, except upon the 9th and 10th abdominal segments, short. Those upon the dorsal surface are mostly curved, and their apices are fimbriate (fig. 4h); unspecialised pairs with acute apices, in dorsal aspect, are: head, pairs 3 and 5; prothorax, pairs 2 and 3; 10th abdominal segment, pairs 1 and 2. In ventral aspect flagelliform setae occur in the position of pair 2 upon the metathorax, and upon the 10th abdominal segment.

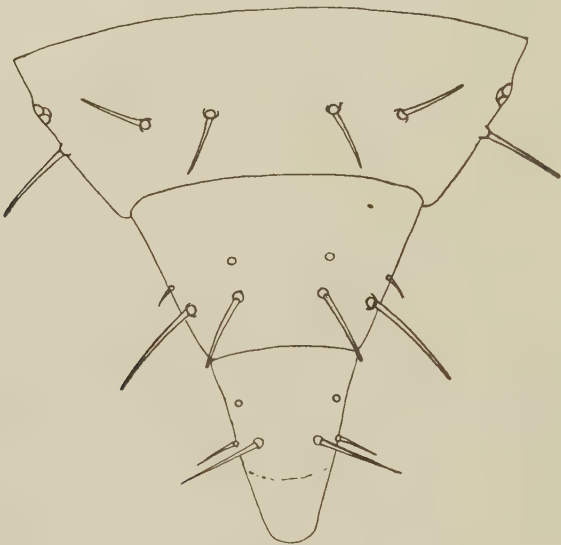
Length of setae in μ Pair no.	Dorsal aspect							Ventral aspect			
	1	2	3	4	5	6	7	1	2	3	4
Head . . .	10	10	15	10	5			35	15	5	10
Prothorax . .	10	5	10	10	10	10	10				
Mesothorax .	10	5	5	10	10	10	10	10	25	10	
Metathorax .	10	5	5	5	10			10	35	—	
Abdomen I–VII .				10–15					10–15		
„ VIII .	15	15	15					15	15	20	
„ IX .	25	35	k 20					20	40		
„ X .	40	15						45	45		

1st instar.

Differs from 2nd instar in fainter sclerotisation of the head. Chaetotaxy: majority of setae, except upon the 10th abdominal segment, very short. Specialised setae are

wanting. Longest setae upon meso- and metathoracic coxae and on underside of 2nd antennal joint, 30–35 μ long.

Length of setae in μ Pair no.	Dorsal aspect							Ventral aspect			
	1	2	3	4	5	6	7	1	2	3	4
Head				5–10				35	10	5	5
Thoracic segments.				5–10							
Abdomen I–VI .				5–10					5–10		
" VII & VIII	10	10	15					10			
" IX .	20	25						25			
" X .	50	15						45	50		



23

FIG. 23.—*Chaetanaphothrips* sp. 2nd instar. $\times$ 230. 8th–11th abdominal segments, dorsal aspect.

Source of material: Aberdeenshire, Scotland, on grass; collected by Dr. G. D. Morison. Hertfordshire, July 1934, on grass; collected by Miss A. M. Lysaght.

Incertae sedis.

Antennae short, 6-jointed; 5th and 6th joints each much shorter than the 4th; 3rd joint expanded gradually from the base; 6th joint pointed apically; 4th joint with 3 distally placed trichomes. Posterior margin of 9th abdominal segment devoid of processes. No pair or pairs of setae upon the 7th abdominal segment conspicuously longer than other setae upon the segment.

Chaetanaphothrips sp.

* 2nd instar (fig. 23; integument, fig. 45f).

Approximate dimensions: length 1.3 mm. Head, length 0.23 mm., breadth 0.13 mm. Antenna, length 0.28 mm. General colour: pale yellow to pink. Head, in ventral aspect, scutiform. Sclerotisation: of main body divisions, none. Antennal annulations broad, approximate number, 3rd joint, 5; 4th joint, 7. Integumental structures: integument of thoracic and first eight abdominal segments beset with inconspicuous oval plaques devoid of microtrichia. Microtrichia on seams of 3rd and 4th antennal joints very short; trichomes short. Spiracles: peritremes of 2nd and 8th abdominal segments small, about 12 μ in diameter. Pori: a pair dorsally on each of the 9th and 10th abdominal segments. Chaetotaxy: majority of setae of moderate length, many of those in dorsal and lateral positions with penicilliform or blunt apices.

Length of setae in μ Pair no.	Dorsal aspect							Ventral aspect			
	1	2	3	4	5	6	7	1	2	3	4
Head . . .	10	25	15	20	5			20	25	5	5
Prothorax . .	20	20	15	15	20	25	25				
Mesothorax . .	20	15	10	20	15	20	25	15	20	25	
Metathorax . .	20	10	15	20	25			10	20	—	
Abdomen I . .	15	20									
„ II . . .	25	25	25					15			
„ III . . .	25	25	25					15	15	20	
„ IV . . .	25	25	30					20	20	25	
„ V . . .	25	30	35					20	25	30	
„ VI . . .	30	35	45					25	25	35	
„ VII . . .	35	40	45					30	25	35	
„ VIII . . .	30	35	45					35	30	35	
„ IX . . .	45	55	k 15					35	50		
„ X . . .	50	15						50	40		

1st instar.

General colour, white to pale yellow. Differs from 2nd instar in the chaetotaxy. Chaetotaxy: majority of setae, except upon the 9th and 10th abdominal segments, very short, their apices blunt. Longest setae upon meso- and metathoracic coxae, and on underside of 2nd antennal joint, 15–20 μ long.

Length of setae in μ Pair no.	Dorsal aspect							Ventral aspect			
	1	2	3	4	5	6	7	1	2	3	4
Head . . .				5–15					5–15		
Thoracic segments .				5–15							
Abdomen I–V . . .				5–15				10			
„ VI–VIII . . .	10	15	20					15			
„ IX . . .	30	40						25			
„ X . . .	40	15						40	50		

Source of material: Hertfordshire, December 1938, on cymbidium under glass.

Scolothrips sexmaculatus Pergande.

2nd instar (fig. 24; head, fig. 1f; antenna, fig. 2f; integument, fig. 45g).

Approximate dimensions : length 1.0 mm. Head, length 0.13 mm., breadth 0.09 mm. Antenna, length 0.13 mm. General colour : white. Head, in ventral aspect, pyriform. Sclerotisation : integument of body divisions unsclerotised; antennal annulations indistinct. Integumental structures : integument of thoracic and first eight abdominal segments beset with inconspicuous oblong plaques, with dark margins, but devoid of microtrichia. Microtrichia upon seams of 3rd and 4th antennal joints very short; trichomes long. Spiracles : peritremes of 2nd and 8th abdominal segments small, about 7 μ in diameter. Chaetotaxy : majority of setae very long, their apices acute; those upon the antennae and legs of moderate length.

Length of setae in μ Pair no.	Dorsal aspect							Ventral aspect			
	1	2	3	4	5	6	7	1	2	3	4
Head . . .	15	30	15	65	10			30	35	30	10
Prothorax . .	75	70	35	30	55	45	65	25	40	40	
Mesothorax . .	55	35	20	55	70	5	65	30	35	—	
Metathorax . .	60	35	20	50	65						
Abdomen I . .	50	45									
" II . . .	50	50	35					35			
" III . . .	50	50	35					30	30		
" IV . . .	50	50	35					35	30	40	
" V . . .	50	50	45					35	35	40	
" VI . . .	50	50	55					35	35	45	
" VII . . .	50	50	50					35	35	45	
" VIII . .	45	40	50					35	35	40	
" IX . . .	45	65	k 25					35	35	60	
" X . . .	30	10						50	45		

Source of material : California, U.S.A., October 1937; predatory upon *Tetranychus* on citrus; collected by Prof. H. S. Smith, and received alive in England.

1st instar.

No material available.

THRIPINAE.

Head, in ventral aspect, scutiform. Antennae short, 6-jointed; 5th and 6th joints each much shorter than the 4th; 3rd joint expanding gradually from the base; 6th joint pointed apically; approximate number of annulations on joint 3, 4; on joint 4, 7; seams of 4th joint beset with microtrichia; 4th joint with 3 distally placed trichomes of moderate length. Posterior margin of 9th abdominal segment beset with processes. A single pair of pori present dorsally upon each of the 9th and 10th abdominal segments. Majority of setae moderately long to long; no pair or pairs of setae upon the 7th abdominal segment conspicuously longer than other setae upon that segment.

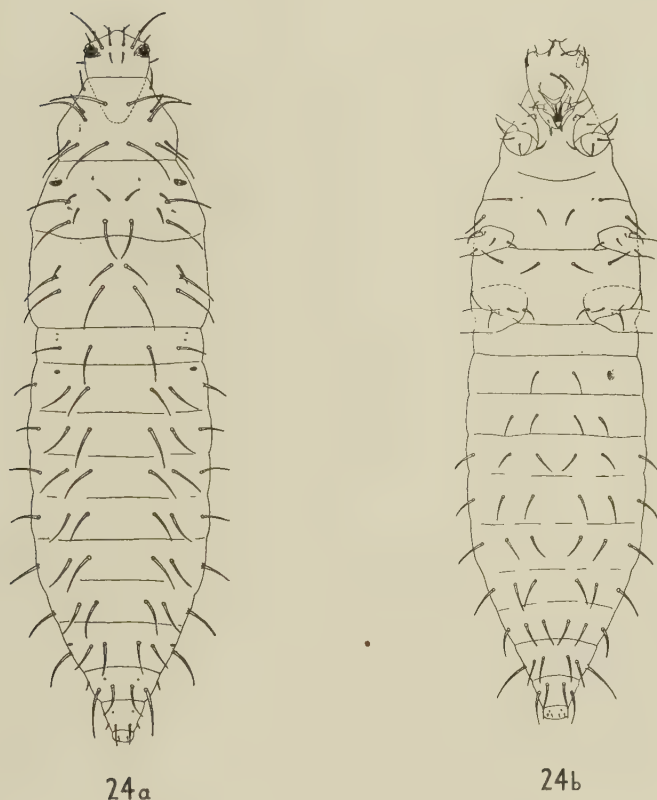


FIG. 24.—*Scolothrips sexmaculatus* Pergande. 2nd instar. $\times 90$. a, dorsal aspect; b, ventral aspect.

Frankliniella intonsa Trybom.

2nd instar (fig. 25; integument, fig. 46a).

Approximate dimensions: length 1.5 mm. Head, length 0.16 mm., breadth 0.1 mm. Antenna, length 0.21 mm. General colour: orange yellow. Sclerotisation: posterior margin of 9th abdominal segment dorsally with a yellowish-grey band which includes the median seta insertions. Posterior half of 10th abdominal segment yellowish-grey. Integumental structures: posterior margin of 9th abdominal segment beset, dorsally and laterally, with some 18 narrowly cuneate processes, each about 4μ in length, and arranged at irregular intervals; laterally these processes are rather longer. Integument of mesothorax to 8th abdominal segment in dorsal aspect beset with transverse rows of small slightly raised, rounded or oval plaques, the majority of which bear a short microtrichium; upon the 7th and 8th abdominal segments the microtrichia become longer; in ventral aspect, integument of thoracic and 1st abdominal segments beset with rather more prominent oval or oblong plaques devoid of microtrichia; 2nd to 8th abdominal segments as in dorsal aspect. Spiracles: peritremes of 2nd and 8th abdominal segments small, about 10μ in diameter. Chaetotaxy: setae unspecialised.

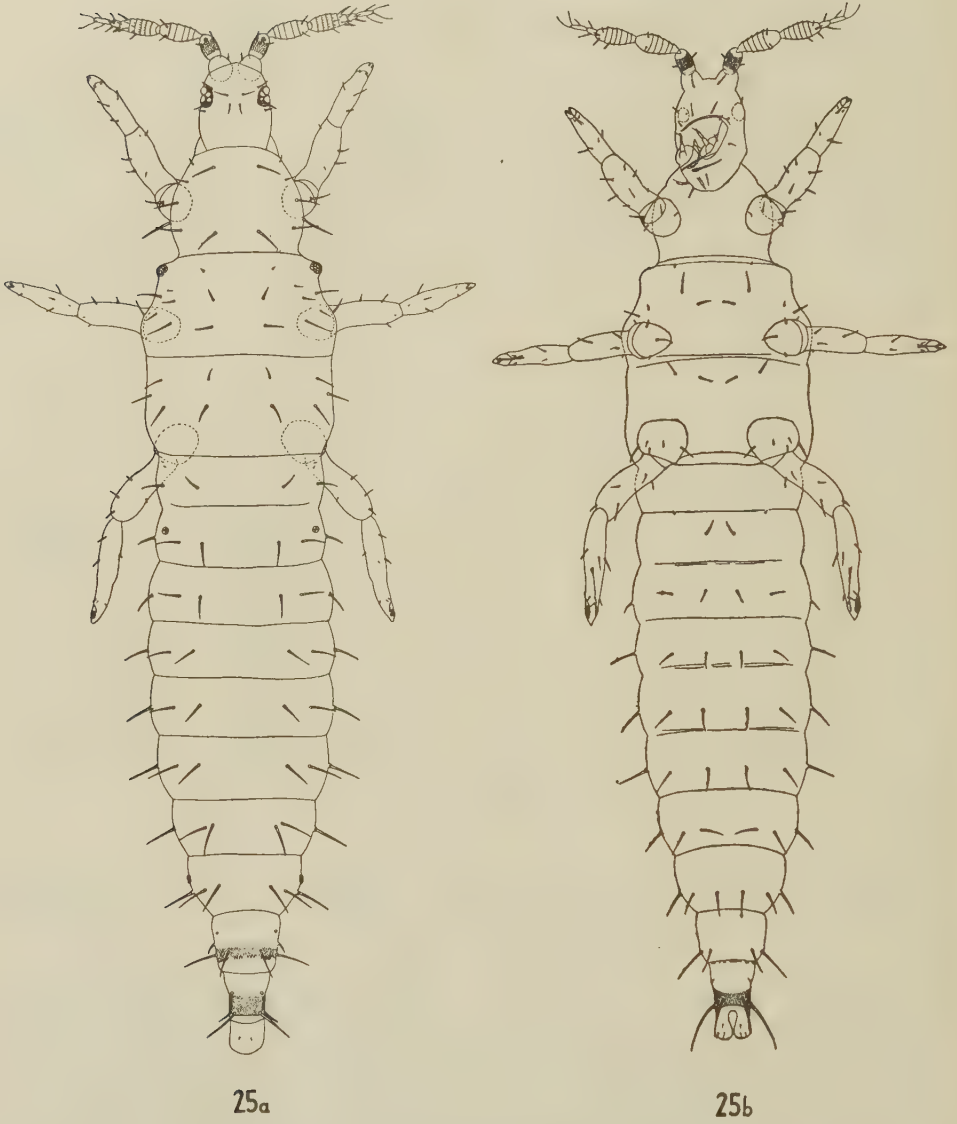


FIG. 25.—*Frankliniella intonsa* Trybom. 2nd instar. $\times 90$. a, dorsal aspect; b, ventral aspect.

Length of setae in μ	Pair no.	Dorsal aspect							Ventral aspect			
		1	2	3	4	5	6	7	1	2	3	4
Head . . .	15	25	20	30	10			25	25	10	10	
Prothorax . . .	30	35	15	20	35	45	35					
Mesothorax . . .	25	20	10	35	15	15	35	20	30	25		
Metathorax . . .	25	15	25	30	35			20	25			
Abdomen I . . .	20	30										
„ II . . .	30	30	30					25				
„ III . . .	35	35	35					20	20	20		
„ IV . . .	35	35	35					25	25	30		
„ V . . .	35	35	40					25	30	35		
„ VI . . .	40	40	45					30	35	35		
„ VII . . .	40	45	50					35	35	40		
„ VIII . . .	40	40	45					35	30	30		
„ IX . . .	40	50	k 15					35	55			
„ X . . .	55	25						55	60			

1st instar.

Differs from 2nd instar as follows :—

Integumental structures : posterior margin of 9th abdominal segment beset dorsally and laterally with about 12 narrowly cuneate processes, each about 4μ long, and arranged at regular intervals. In dorsal aspect, integument of prothorax beset with indistinct oval plaques devoid of microtrichia; from mesothorax to 8th abdominal segment with minute circular plaques each bearing a microtrichium; in ventral aspect, integument of thoracic and 1st abdominal segments with small oblong plaques devoid of microtrichia; of 2nd to 8th abdominal segments as in dorsal aspect. Chaetotaxy : setae with knobbed apices occur dorsally in the position of pairs 1 and 2 on the 9th, and pair 1 on the 10th abdominal segment. All other setae unspecialised. Longest setae upon meso- and metathoracic coxae $25-30\mu$; upon underside of 2nd antennal joint 40μ .

Length of setae in μ	Dorsal aspect							Ventral aspect				
	Pair no.	1	2	3	4	5	6	7	1	2	3	4
Head . . .	10	20	15	15					25	15	20	10
Prothorax . . .	20	15	10	10	25			25				
Mesothorax . . .	15			5		20		20				
Metathorax . . .	15		10	10	15							
Abdomen I-VI . . .				10-25					10-15			
" VII . . .	20	25	25						20			
" VIII . . .	20	20	20						15			
" IX . . .	35	55							20	30		
" X . . .	50	20							65	70		

Source of material : Hampshire, May 1937; Devonshire, June 1937; in flowers of *Orchis mascula*.

Kakothrips pisivorus Westwood.

2nd instar (fig. 26; head, fig. 1g; antenna, fig. 2g; integument, fig. 46b).

Approximate dimensions : length 1.8 mm. Head, length 0.2 mm., breadth 0.12 mm. Antenna, length 0.27 mm. General colour : yellow to orange yellow; 9th and 10th abdominal

segments yellowish-brown to dark brown. Sclerotisation: greater portion of 9th abdominal segment yellowish-brown; 10th abdominal segment brown. Integumental structures: posterior margin of 9th abdominal segment beset dorsally and laterally with some 18 acicular processes, each with a broadly dilate base, and about $7\ \mu$ in length. Integument of thoracic and first eight abdominal segments beset with rings of inconspicuous

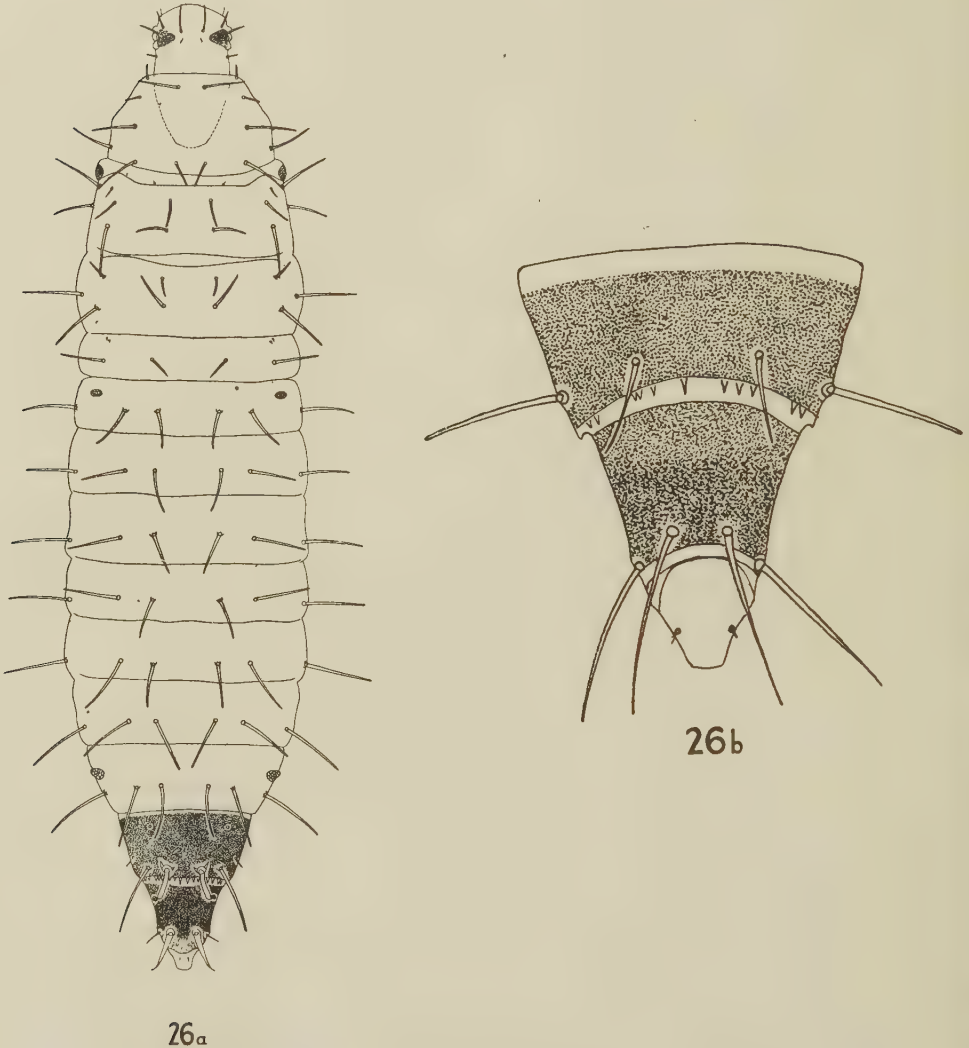


FIG. 26.—*Kakothisrips pisivorus* Westwood. 2nd instar. a, dorsal aspect; $\times 90$. b, 9th-11th abdominal segments, ventral aspect; $\times 230$.

plaques, devoid of microtrichia. Spiracles: peritremes of 2nd and 8th abdominal segments conspicuous, each measuring about $20\ \mu \times 15\ \mu$. Chaetotaxy: majority of dorsal and lateral setae penicilliform or blunt apically; those of pair 1 upon the 9th abdominal segment in dorsal aspect very thick, their apices sharply truncate (fig. 4j); of pair 1 upon the 10th segment dorsally similar, but their apices acuminate (fig. 4k). Dorsal seta

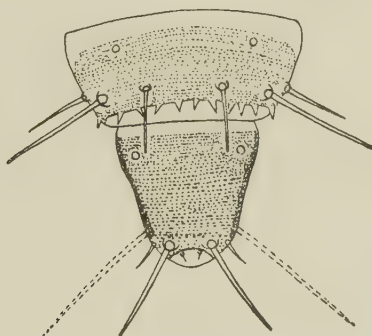
upon thoracic and abdominal segments, and ventral setae upon the more posterior abdominal segments exceptionally long.

Length of setae in μ Pair no.	Dorsal aspect							Ventral aspect			
	1	2	3	4	5	6	7	1	2	3	4
Head . . .	10	35	25	40	15			20	25	5	5
Prothorax . .	45	55	25	25	70	65	65				
Mesothorax . .	50	35	20	75	40	40	75	25	35	45	
Metathorax . .	60	30	30	75	75			20	30	—	
Abdomen I . .	30	55									
„ II . . .	55	60	65					30			
„ III . . .	55	60	70					25	35	50	
„ IV . . .	55	65	75					30	40	60	
„ V . . .	55	70	75					30	45	70	
„ VI . . .	65	75	90					45	55	75	
„ VII . . .	75	75	90					50	60	80	
„ VIII . . .	70	75	85					55	60	65	
„ IX . . .	40	90	k 20					55	75		
„ X . . .	45	25						100	95		

1st instar (fig. 27).

Differs from 2nd instar as follows :—

Sclerotisation: 9th and 10th abdominal segments less strongly sclerotised. Integumental structures: processes upon posterior margin of 9th abdominal segment fewer in



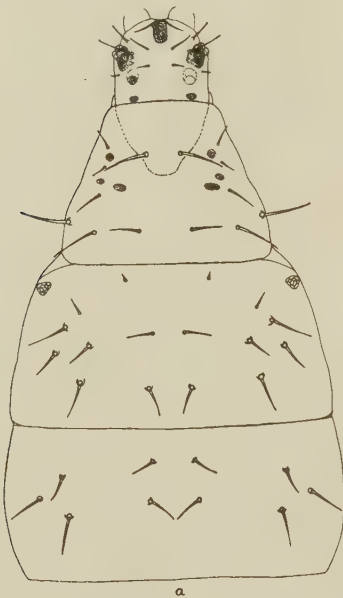
27

FIG. 27.—*Kakothrips pisivorus* Westwood. 1st instar. $\times 230$. 9th–11th abdominal segments, dorsal aspect.

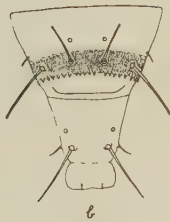
number (about 12); plaques smaller but more prominent. Chaetotaxy: setae of pair 1 upon each of the 9th and 10th abdominal segments in dorsal aspect not thick, their apices blunt or slightly knobbed. Exceptionally long setae present only upon 9th and 10th abdominal segments. Longest setae on meso- and metathoracic coxae, and upon underside of 2nd antennal joint 20–30 μ .

Length of setae in μ	Dorsal aspect		Ventral aspect	
Head to Abdomen VIII	10-25		5-20	
Pair no.	1	2	1	2
Abdomen IX	35	65	20	35
„ X	60	25	90	95

Source of material : Surrey, June 1913, on bean ; collected by Dr. C. B. Williams. Hertfordshire, July 1931, on pea ; and in flower of cyclamen grown under glass.



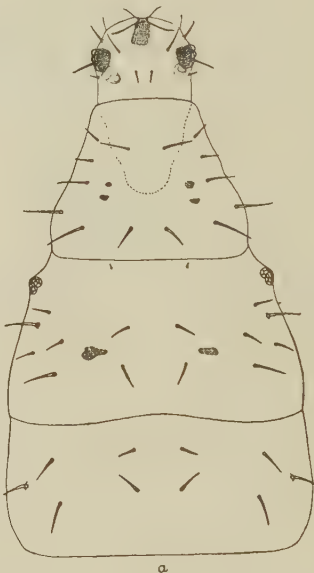
a



b

28

FIG. 28.—*Taeniothrips picipes* Zetterstedt. 2nd instar, dorsal aspect. $\times 120$. a, head and thoracic segments; b, 9th-11th abdominal segments.



a



b

29

FIG. 29.—*Taeniothrips vulgatissimus* Haliday. 2nd instar, dorsal aspect. $\times 120$. a, head and thoracic segments; b, 9th-11th abdominal segments.

Taeniothrips picipes Zetterstedt.

2nd instar (fig. 28; integument, fig. 46c).

Approximate dimensions: length 1.8 mm. Head, length 0.17 mm., breadth 0.11 mm. Antenna, length 0.22 mm. General colour: orange yellow to light red. Sclerotisation: in dorsal aspect, head with an urceolate grey area at the apex, a pair of indistinct grey areas in the median region, and a pair of most conspicuous yellowish-grey rounded spots in the posterior region; prothorax with 2-4 pairs of rounded grey spots in the anterior portion; posterior margin of 9th abdominal segment dorsally with a broad yellowish-grey band, extending well beyond the median seta-insertions; posterior third of 10th abdominal segment grey. Integumental structures: posterior margin of 9th abdominal segment beset dorsally and laterally with some 24 conical processes, set at rather irregular intervals, and each about $5\ \mu$ long. Integument of posterior portion of prothorax in dorsal aspect and its whole surface in ventral aspect beset with oblong or rounded plaques, devoid of microtrichia; that of mesothorax to 2nd abdominal segment with rings of prominent oblong plaques, at least some of which, in the anterior portion of each segment only, bear a microtrichium; posteriorly to the 2nd abdominal segment, the microtrich-bearing plaques increase on each segment until upon the 8th, only those of a few posterior rings are simple. Spiracles: peritremes of the 2nd and 8th abdominal segments conspicuous, respectively about $20\ \mu \times 10\ \mu$ and $15\ \mu \times 10\ \mu$. Chaetotaxy: majority of setae moderately long to long; those upon the 7th and 8th abdominal segments in dorsal aspect $45\text{--}55\ \mu$. Setae of pair 1, and sometimes of pair 2, upon the 9th abdominal segment in dorsal aspect slightly knobbed or blunt at their apices; apices of other setae acute.

Length of setae in μ Pair no.	Dorsal aspect							Ventral aspect			
	1	2	3	4	5	6	7	1	2	3	4
Head . . .	10	25	25	40	10			30	30	10	15
Prothorax . .	30	45	25	15	30	55	50				
Mesothorax .	30	25	15	40	25	30	40	20	25	35	
Metathorax .	30	25	30	35	45			20	25	—	
Abdomen I .	30	35									
„ II . . .	30	35	35					25			
„ III . . .	30	40	40					25	25	20	
„ IV . . .	35	40	45					25	30	35	
„ V . . .	35	40	45					25	35	45	
„ VI . . .	35	45	50					30	35	50	
„ VII . . .	45	50	50					35	40	50	
„ VIII . .	40	50	55					40	45	55	
„ IX . . .	45	65	k 20					40	40		
„ X . . .	70	20						80	75		

1st instar.

Sclerotisation: wanting upon the head and thoracic segments; posterior margin of 9th abdominal segment dorsally with a grey band extending slightly beyond the median seta-insertions; posterior half of 10th abdominal segment grey. Integumental structures: posterior margin of 9th abdominal segment beset dorsally with 12-18 narrowly cuneate, sharply pointed processes, each $3\text{--}4\ \mu$ long. Integument of prothorax in dorsal aspect beset anteriorly with small rounded plaques devoid of microtrichia, posteriorly with semicircular (rarely oblong) plaques, most of which bear a short microtrichium; that of mesothorax to 8th abdominal segment with small semicircular plaques, each bearing a short dark microtrichium; in ventral aspect, integument of thoracic and 1st abdominal segments beset with simple oblong plaques, much elongated upon the mesothorax; that of the 2nd to 8th abdominal segments as in dorsal aspect. Chaetotaxy: only setae of

pairs 1 and 2 upon the 9th abdominal segment in dorsal aspect with blunt apices. Exceptionally long setae occur upon the 10th abdominal segment. Longest setae on meso- and metathoracic coxae and upon underside of 2nd antennal joint, 35 μ .

Length of setae in μ Pair no.	Dorsal aspect							Ventral aspect			
	1	2	3	4	5	6	7	1	2	3	4
Head . . .	10	25	25	30				40	25	10	10
Prothorax . . .	25	30	15	10	20						
Mesothorax . . .	20			25		10	25				
Metathorax . . .	25		10	20	30						
Abdomen I . . .	10	15									
" II . . .	15	20	15					10			
" III . . .	15	20	20					10			
" IV . . .	15	20	20					10			
" V . . .	20	20	30					15			
" VI . . .	20	25	30					20			
" VII . . .	25	30	35					25			
" VIII . . .	25	30	40					30			
" IX . . .	45	70							50		
" X . . .	105	25						80	120		

Source of material : Kincardine, Scotland, June 1929, on *Silene maritima* ; collected by Dr. G. D. Morison.

Taeniothrips vulgatissimus Haliday.
2nd instar (fig. 29 ; head, fig. 1h).

Approximate dimensions : length 1.4 mm. Head, length 0.18 mm., breadth 0.11 mm. Antenna, length 0.23 mm. General colour : pale to greyish-yellow. Differs from *T. picipes*, 2nd instar, as follows : in dorsal aspect, posterior pair of spots on head wanting ; anterior portion of prothorax with one pair, or two adjacent pairs of small rounded grey spots ; median portion of mesothorax with a pair of small grey spots ; posterior margin of 9th abdominal segment with a yellowish to brownish-grey band, extending to but not beyond the median seta-insertions ; processes calcariform, about 30 in number and 5 μ in length, arranged regularly and closely together ; setae upon 10th abdominal segment shorter.

Length of setae in μ Pair no.	Dorsal aspect							Ventral aspect			
	1	2	3	4	5	6	7	1	2	3	4
Head . . .	10	25	25	35	5			30	35	5	10
Prothorax . . .	30	30	20	15	30	50	40				
Mesothorax . . .	25	20	15	30	20	15	30	20	30	25	
Metathorax . . .	25	20	25	25	30			15	25	—	
Abdomen I . . .	20	25									
" II . . .	25	25	25					20			
" III . . .	25	25	30					20	25	15	
" IV . . .	25	30	35					20	30	25	
" V . . .	30	35	40					25	35	35	
" VI . . .	35	40	45					30	35	35	
" VII . . .	35	40	45					35	40	45	
" VIII . . .	35	40	45					35	40	35	
" IX . . .	40	50	k 15					35	50		
" X . . .	45	25						55	60		

1st instar.

Differs from *T. picipes*, 1st instar, as follows:—

In dorsal aspect, anterior portion of prothorax with a pair of grey spots; processes on posterior margin of 9th abdominal segment more broadly cuneate; plaques upon posterior portion of prothorax devoid of microtrichia; upon mesothorax to 8th abdominal segment oblong, with shorter microtrichia. Chaetotaxy: in dorsal aspect, setae of pairs 1 and 2 upon the 9th, and of pair 1 upon the 10th abdominal segments are conspicuously knobbed. Setae upon the 10th abdominal segment much shorter than in *T. picipes*. Longest setae on meso- and metathoracic coxae and upon underside of 2nd antennal joint, 30 μ .

Length of setae in μ .	Dorsal aspect		Ventral aspect	
Head to Abdomen VIII	5-25		5-15	
Pair no.	1	2	1	2
Abdomen IX	35	50		25
„ X	50	20	35	50

Source of material: N. Ireland; Belfast, August 1928, on *Heracleum sphondylium*; collected by Dr. G. D. Morison. Cornwall, July 1932, in flowers of galium. Hertfordshire, September 1932, in flowers of dandelion.

Taeniothrips atratus Haliday.

2nd instar (fig. 30).

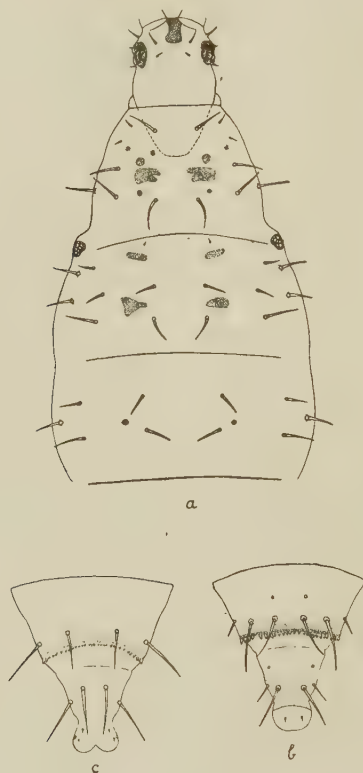
Dimensions and colour as for *T. vulgatissimus*. Sclerotisation: in dorsal aspect, head sometimes as in *T. picipes*, sometimes as in *T. vulgatissimus*; prothorax with a pair of large grey areas, comprised of 3-4 fused spots, and 3-4 pairs of small separate grey spots; mesothorax with an anterior and a posterior pair of small grey spots; posterior position of metathorax often with a single pair of very small rounded spots; 9th and 10th abdominal segments as in *T. vulgatissimus*. Integumental structures: processes upon posterior margin of 9th abdominal segment as in *T. vulgatissimus*, but laterally four to six on each side are larger than the remainder, and measure up to 7 μ in length. Plaques rather more elongate than in *T. picipes*, and fewer bear a microtrichium. Chaetotaxy: as in *T. vulgatissimus*.

1st instar.

Sclerotisation: in dorsal aspect, head with a pair of grey areas in the median portion, just posterior to the level of the eyes, and posterior to these, a pair of rounded grey spots; prothorax, in the anterior portion, with a large pair of grey areas, each composed of 4 adjacent spots, and 2 or 3 pairs of separate grey spots (much as in the 2nd instar); posterior margin of 9th abdominal segment with a narrow grey band, extending to, but not beyond, the median seta-insertions; posterior half of 10th abdominal segment grey. Integumental structures: processes upon posterior margin of 9th abdominal segment much as in *T. picipes*, 1st instar, each 3-5 μ long and finer than in the latter species; plaques as in *T. picipes*, microtrichia rather darker and therefore more conspicuous. Chaetotaxy:

apices of setae as in *T. picipes*, 1st instar. Length of setae as in *T. vulgatissimus*, 1st instar.

Source of material: Hertfordshire, June 1935 and September 1939, in flowers of carnation under glass.



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FIG. 30.—*Taeniothrips atratus* Haliday. 2nd instar. $\times 120$. a, head and thoracic segments, dorsal aspect; b, 9th–11th abdominal segments, dorsal aspect; c, 9th–11th abdominal segments, ventral aspect.

Taeniothrips inconsequens Uzel.

2nd instar (fig. 31; integument, fig. 46d).

Approximate dimensions: length 1.8 mm. Head, length 0.2 mm., breadth 0.13 mm. Antenna, length 0.22 mm. General colour: white to yellowish-white. Sclerotisation: in dorsal aspect, posterior margin of 9th abdominal segment with a narrow circinate yellow band. Integumental structures: posterior margin of 9th abdominal segment beset dorsally and laterally with 4 pairs of large, broadly cuneate yellow processes, the median and extreme marginal pairs measuring respectively about $25\ \mu$ and $15\ \mu$ in length, the two lateral pairs about $30\ \mu$, with a breadth of $20\ \mu$ at the base. Integument from mesothorax to 8th abdominal segment beset with comparatively large but inconspicuous oval

plaques, devoid of microtrichia. Spiracles: peritremes of 2nd and 8th abdominal segments very large, each about $25\ \mu \times 10\ \mu$. Chaetotaxy: apices of setae acute.

Length of setae in μ Pair no.	Dorsal aspect							Ventral aspect			
	1	2	3	4	5	6	7	1	2	3	4
Head	15	25	20	35	10			25	35	10	10
Prothorax	40	45	30	30	40	50	50				
Mesothorax . . .	35	30	25	45	35	30	45	20	30	35	
Metathorax . . .	35	30	35	35	40			15	25	—	
Abdomen I	30	35									
" II	30	35	35					25			
" III	30	35	35					25	25	25	
" IV	35	40	40					25	30	35	
" V	35	40	45					30	35	45	
" VI	45	45	50					35	40	50	
" VII	50	50	55					40	45	50	
" VIII . . .	45	45	50					45	45	50	
" IX	30	50	k 20					55	55		
" X	50	15						55	65		

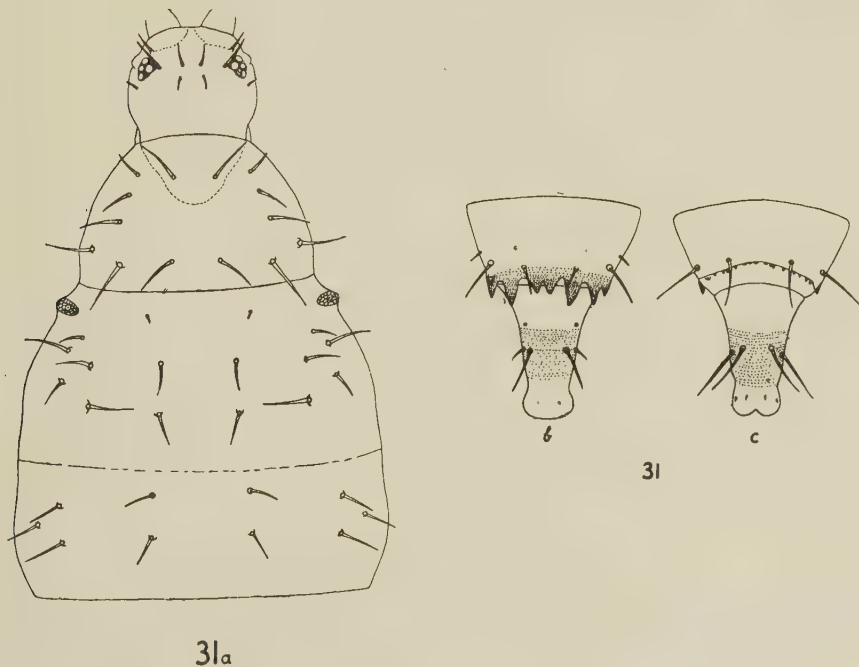


FIG. 31.—*Taeniothrips inconsequens* Uzel. 2nd instar. $\times 120$. a, head and thoracic segments, dorsal aspect; b, 9th-11th abdominal segments, dorsal aspect; c, 9th-11th abdominal segments, ventral aspect.

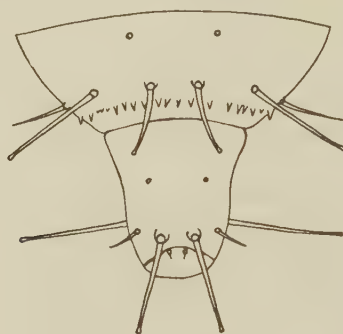
1st instar (fig. 32).

Sclerotisation: posterior margin of 9th abdominal segment dorsally with a narrow indistinct grey band, not extending beyond the median seta-insertions. Integumental

structures: posterior margin of 9th abdominal segment beset dorsally with some 20 rather broadly cuneate, sharp-pointed processes, each 6–8 μ in length. Integument of thoracic and first eight abdominal segments, in dorsal aspect, beset with minute semi-circular plaques, each bearing a hyaline microtrichium; in ventral aspect, that of the thoracic and 1st abdominal segments with simple oval or oblong plaques; of 2nd to 8th abdominal segments as in dorsal aspect. Chaetotaxy: setae of pairs 1 and 2 upon the 9th, and pair 1 upon the 10th abdominal segments sharply expanded at their apices. Longest setae on meso- and metathoracic coxae and upon underside of 2nd antennal joint 35 μ .

Length of setae in μ	Dorsal aspect		Ventral aspect	
Head	10–30		5–35	
Prothorax to Abdomen VIII . . .	10–25		5–25	
Pair no.	1	2	1	2
Abdomen IX	35	60		30
„ X	55	20	55	65

Source of material: Hertfordshire, May 1932, in foliage buds of apple. Hertfordshire, June 1931, in flowers of dandelion.



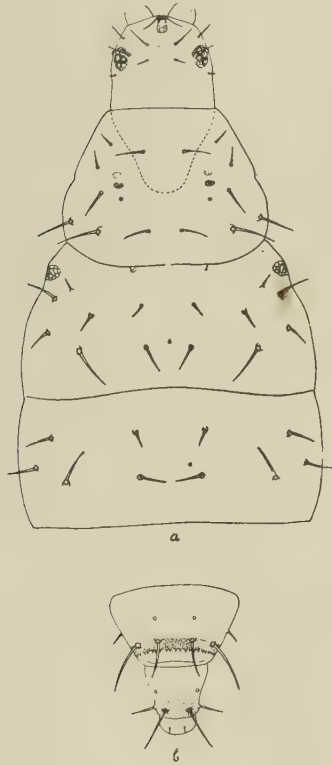
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FIG. 32.—*Taeniothrips inconsequens* Uzel. 1st instar. $\times 230$. 9th–11th abdominal segments, dorsal aspect.

Thrips physapus L.

2nd instar (fig. 33; integument, fig. 46e).

Approximate dimensions: length 1.5 mm. Head, length 0.19 mm., breadth 0.11 mm. Antenna, length 0.2 mm. General colour: light to dirty grey. Sclerotisation: in dorsal aspect, head with an urceolate grey area at the apex; sometimes a pair of grey spots just posterior to the level of the eyes; anterior portion of prothorax with 2–4 pairs of oval or round grey spots; posterior margin of 9th abdominal segment with an indistinct yellowish-grey band, extending only to the median seta-insertions; posterior third of 10th abdominal segment yellowish-grey. Integumental structures: posterior margin of 9th abdominal segment beset dorsally and laterally with some 24 conical processes, each about 3 μ long. Integument of thoracic and first eight abdominal segments beset with prominent oblong plaques, occasionally with dark margins, but devoid of microtrichia except ventro-laterally upon the 8th abdominal segment. Spiracles: peritremes of 2nd and 8th abdominal segments conspicuous, each about 20 $\mu \times 12 \mu$. Chaetotaxy: setae with blunt apices



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FIG. 33.—*Thrips physapus* L. 2nd instar, dorsal aspect. $\times 120$. a, head and thoracic segments; b, 9th-11th abdominal segments.

occur sometimes only upon the 9th and 10th abdominal segments in dorsal aspect; majority of setae of moderate length, those upon the 7th and 8th abdominal segments in dorsal aspect 35-50 μ .

Length of setae in μ Pair no.	Dorsal aspect							Ventral aspect			
	1	2	3	4	5	6	7	1	2	3	4
Head . . .	10	25	20	20	5			20	35	5	5
Prothorax . . .	25	25	15	20	25	30	35				
Mesothorax . . .	30	15	10	35	20	25	40	15	20	25	
Metathorax . . .	30	15	25	25	35			15	20		
Abdomen I . . .	15	25									
„ II . . .	25	30	30					20			
„ III . . .	25	30	30					15	20	25	
„ IV . . .	25	30	35					20	25	30	
„ V . . .	30	40	45					25	30	35	
„ VI . . .	35	40	50					30	30	40	
„ VII . . .	40	45	50					35	35	40	
„ VIII . . .	35	45	45					30	30	35	
„ IX . . .	45	55	k 20					30	50		
„ X . . .	40	25						50	50		

1st instar.

Sclerotisation: only extreme posterior portion of 10th abdominal segment grey. Integumental structures: posterior margin of 9th abdominal segment beset dorsally with 10-14 narrowly cuneate processes, the longest of which do not exceed 3 μ . In dorsal aspect, integument of prothorax beset with indistinct circular plaques, some of which, postero-laterally, bear a microtrichium; that of mesothorax to 8th abdominal segment with minute semi-circular plaques, each of which bears a short microtrichium; in ventral aspect, integument of thoracic and 1st abdominal segment beset with simple oval plaques; 2nd to 8th abdominal segments as in dorsal aspect. Chaetotaxy: setae with blunt apices occur only upon the 9th abdominal segment in dorsal aspect. Longest setae upon the meso- and metathoracic coxae and on underside of 2nd antennal joint 15-20 μ .

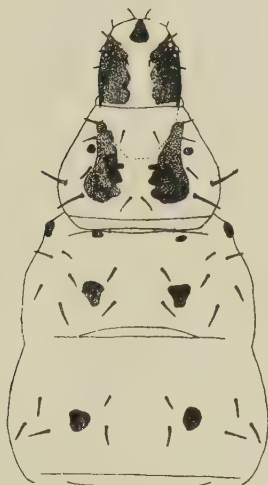
Length of setae in μ Pair no.	Dorsal aspect							Ventral aspect			
	1	2	3	4	5	6	7	1	2	3	4
Head . . .	10	15	10	15				15	15	5	5
Prothorax . .	10	10	5	10	10		15				
Mesothorax . .	10			10		10	15				
Metathorax . .	10		10	10	15						
Abdomen I . .	5	10									
" II . . .	10	10	10					10			
" III . . .	10	10	10					10			
" IV . . .	10	10	15					10			
" V . . .	10	15	20					10			
" VI . . .	15	20	20					10			
" VII . . .	15	20	20					15			
" VIII . . .	15	20	20					15			
" IX . . .	30	30							25		
" X . . .	30	15						30	30		

Source of material: Hertfordshire, June 1931; Cornwall, July 1932; Scotland (Inverness), July 1936, collected by Dr. G. D. Morison; in flowers of dandelion.

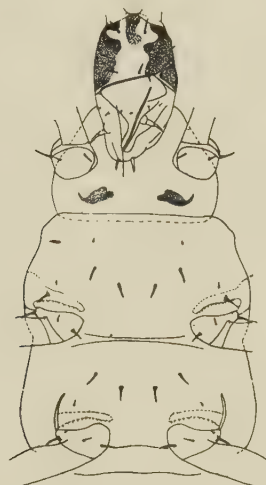
Thrips validus Uzel.

2nd instar (figs. 34 and 35; antenna, fig. 2h; leg, fig. 3c; integument, fig. 47a).

Approximate dimensions: length 1.2 mm. Head, length 0.19 mm., breadth 0.1 mm. Antenna, length 0.16 mm. General colour: orange yellow to light red; greater portion of 9th and 10th abdominal segments brownish-yellow. Sclerotisation: in dorsal aspect, head with a sub-triangular grey area apically; laterally with a pair of large rectangular grey areas, extending from the eyes to the posterior margin; all but a narrow median area of the prothorax occupied by a pair of convoluted grey masses; mesothorax with a pair of small grey spots near the anterior margin, and a larger pair posteriorly; metathorax with a single pair similar to the latter; posterior two-thirds of 9th and greater portion of 10th abdominal segments brownish-yellow; in ventral aspect head and posterior abdominal segments sclerotised as dorsally; prothorax with an oval grey spot posterior to the coxa of either side. Integumental structures: posterior margin of 9th abdominal segment beset dorsally and laterally with some 24 calcariform processes, each 5-7 μ in length. In dorsal aspect, integument of thoracic and first eight abdominal segments beset with inconspicuous oblong or oval plaques, the majority with dark margins; those in the



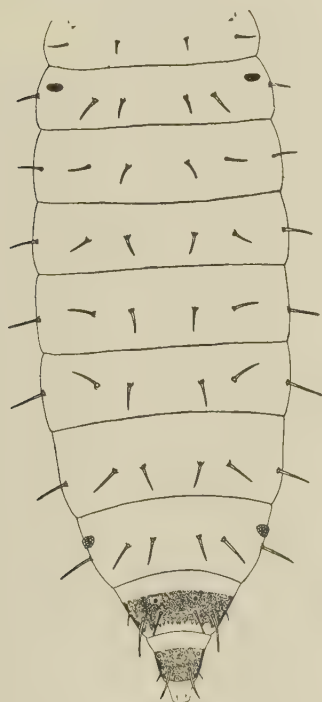
34a



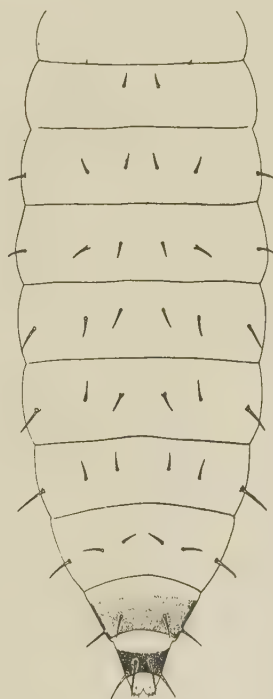
35a

FIG. 34.—*Thrips validus* Uzel. 2nd instar, dorsal aspect. $\times 90$. a, head and thoracic segments; b, abdominal segments.

FIG. 35.—*Thrips validus* Uzel. 2nd instar, ventral aspect. $\times 0$. a, head and thoracic segments; b, abdominal segments.



34b



35b

anterior portion of each segment from the mesothorax to the 7th abdominal segment bear a short microtrichium; upon the 8th only a few posterior rows of plaques are devoid of microtrichia; in ventral aspect, the oblong plaques are devoid of microtrichia except upon the 8th abdominal segment. Spiracles: peritremes of 2nd and 8th abdominal segments conspicuous; dimensions of the former about $20\ \mu \times 10\ \mu$, of the latter $15\ \mu$ diameter. Chaetotaxy: apices of setae acute, only those of pair 2 upon the 9th abdominal segment in dorsal aspect sometimes blunt. Setae upon the 7th and 8th abdominal segments in dorsal aspect short ($30\text{--}35\ \mu$).

Length of setae in μ Pair no.	Dorsal aspect							Ventral aspect			
	1	2	3	4	5	6	7	1	2	3	4
Head . . .	10	20	15	15	10			10	15	5	5
Prothorax . . .	15	15	10	10	20	30	30				
Mesothorax . . .	25	15	15	25	15	20	30	15	20	20	
Metathorax . . .	20	15	15	25	25			15	20	—	
Abdomen I . . .	15	25									
" II . . .	20	25	25					15			
" III . . .	25	30	30					20	20	20	
" IV . . .	25	30	30					20	25	30	
" V . . .	25	30	35					25	25	35	
" VI . . .	25	30	35					25	30	35	
" VII . . .	30	35	35					30	30	40	
" VIII . . .	30	35	35					25	30	35	
" IX . . .	30	40	k 20					30	40		
" X . . .	35	15						45	45		

1st instar.

Sclerotisation: in dorsal aspect, head with a pair of small grey spots near the posterior margin; prothorax laterally with a pair of convoluted grey areas, less extensive than in the 2nd instar; meso- and metathorax each with a pair of small grey spots; posterior margin of 9th abdominal segment with a yellowish-grey band, extending slightly beyond the median seta-insertions; posterior half of 10th abdominal segment brownish-yellow. Integumental structures: posterior margin of 9th abdominal segment beset dorsally with some 10 processes, $2\text{--}4\ \mu$ long, the shorter ones narrowly, the longer ones broadly cuneate. In dorsal aspect, integument of prothorax beset with small simple plaques, round in the anterior, oblong in the posterior portion; of meso- and metathorax with oblong plaques which bear short dark microtrichia only in the anterior portion of each; of the 1st to 8th abdominal segments with small oval or semicircular plaques, each of which bears a short microtrichium; in ventral aspect, integument of thoracic and 1st abdominal segment beset with oblong plaques, some with dark margins, but devoid of microtrichia; of 2nd to 8th abdominal segments as in dorsal aspect. Chaetotaxy: setae upon 9th abdominal segment in dorsal aspect with blunt apices. Longest setae on meso- and metathoracic coxae and upon underside of 2nd antennal joint $15\text{--}20\ \mu$.

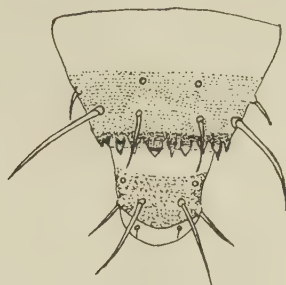
Length of setae in μ	Dorsal aspect		Ventral aspect	
Head to Abdomen VIII	5-20		5-10	
Pair no.	1	2	1	2
Abdomen IX	25	30		25
" X	30	15	30	30

Source of material : Hertfordshire, May to July 1931 and 1932, in flowers of dandelion.

Thrips angusticeps Uzel.

2nd instar (fig. 36).

Approximate dimensions : length 1.25 mm. Head, length 0.16 mm., breadth 0.08 mm. Antenna, length 0.16 mm. General colour : orange yellow; greater portion of 9th and 10th abdominal segments brownish-yellow. Sclerotisation : as in *T. validus*, 2nd instar. Integumental structures : posterior margin of 9th abdominal segment beset dorsally with 7-8 strongly sclerotised hastate or broadly laminate processes, the latter arising from fusion of adjacent elements usually situated medially; these processes measure some



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FIG. 36.—*Thrips angusticeps* Uzel. 2nd instar. $\times 230$. 9th-11th abdominal segments, dorsal aspect.

10 μ in length, while a few additional ones situated laterally on each side are only 3-5 μ long. Integument of thoracic and first eight abdominal segments beset with oblong and a number of circular plaques, some of which have dark margins and bear a microtrichium only in the anterior portion of each of the 7th and 8th abdominal segments in ventral aspect. Spiracles : peritremes of 2nd and 8th abdominal segments of moderate size, dimensions of the former about 15 $\mu \times 10 \mu$, of the latter 10 μ diameter. Chaetotaxy : setae unspecialised; those upon 7th and 8th abdominal segments in dorsal aspect of moderate length (40-50 μ).

Length of setae in μ	Pair no.	Dorsal aspect							Ventral aspect			
		1	2	3	4	5	6	7	1	2	3	4
Head . . .	10	15	15	20	5				15	20	5	5
Prothorax . .	25	30	15	15	25	35	40					
Mesothorax .	25	20	15	35	20	20	35		15	20	25	
Metathorax .	25	15	25	25	30				15	20	—	
Abdomen I .	20	20										
„ II . . .	25	30	25						20			
„ III . . .	25	30	30						20	15	15	
„ IV . . .	30	30	30						20	15	20	
„ V . . .	30	35	30						25	20	30	
„ VI . . .	35	40	40						25	25	30	
„ VII . . .	40	45	45						35	35	35	
„ VIII . .	40	45	50						35	35	35	
„ IX . . .	30	55	k 20						35	50		
„ X . . .	40	25							50	45		

Source of material : Hertfordshire, June 1931, in a flower of dandelion.

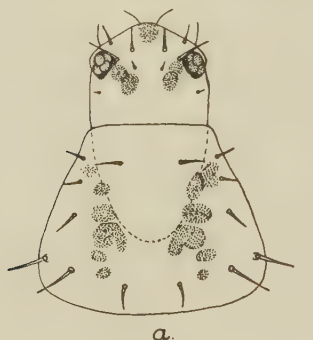
1st instar.

No material available. From O. Ahlberg's description (1924 : 22, figs. 17 and 18A) it would appear that there is very close resemblance to the 1st instar of *T. validus*, the setae upon the 9th and 10th abdominal segment being, however, longer than in the latter.

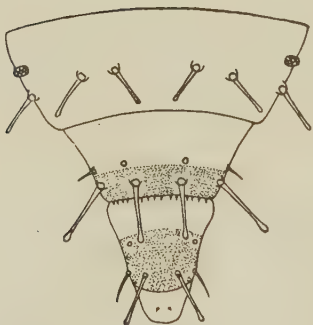
Thrips viminalis Uzel.

2nd instar (fig. 37; integument, fig. 47b).

Approximate dimensions : length 1.0 mm. Head, length 0.17 mm., breadth 0.09 mm. Antenna, length 0.15 mm. General colour : white to pale yellow; posterior portions of 9th and 10th abdominal segments grey to brownish-yellow. Sclerotisation : in dorsal



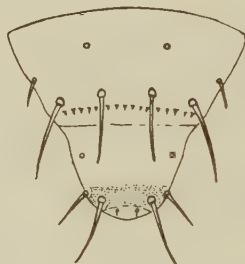
a.



b.

37

FIG. 37.—*Thrips viminalis* Uzel.
2nd instar, dorsal aspect.
× 175. a, head and prothorax; b, 8th-11th abdominal segments.



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FIG. 38.—*Thrips fuscipennis* Haliday.
2nd instar. × 230. 9th-11th abdominal segments, dorsal aspect.

aspect, head with a small quadrangular grey area at apex, and a pair of double grey spots posterior to the level of the eyes; prothorax with one pair of larger, and five or six pairs of smaller round grey spots, arranged as on the arc of a circle on each side; mesothorax with a pair of small grey spots near the anterior margin, and a larger pair posteriorly;

metathorax with a pair of spots similar to the latter; posterior portion of 9th abdominal segment with a broad grey to brownish-yellow band, extending from the pori to the posterior margin; posterior half of 10th abdominal segment grey to brownish-yellow. Integumental structures: posterior margin of 9th abdominal segment beset dorsally and laterally with some 14 narrowly cuneate processes, not exceeding 3μ in length. In dorsal aspect, integument of thoracic and first eight abdominal segments beset with prominent oblong plaques, the majority with dark margins; from the 4th to the 8th abdominal segments, increasing numbers of plaques in the more anterior portions of each segment bear a microtrichium, until all but the posterior two or three rows upon the 8th segment bear microtrichia; in ventral aspect, thoracic segments with simple oblong and rounded plaques; abdominal segments as in dorsal aspect. Spiracles: peritremes of 2nd and 8th abdominal segments of moderate size; dimensions of the former $15\mu \times 10\mu$, of the latter, 10μ diameter. Chaetotaxy: majority of dorsal setae with blunt apices (fig. 4c); those of pairs 1 and 2 upon the 9th, and pair 1 upon the 10th abdominal segments knobbed (fig. 4d). Setae comparatively short, those upon the 7th and 8th abdominal segments in dorsal aspect $30\text{--}35\mu$.

Length of setae in μ Pair no.	Dorsal aspect							Ventral aspect			
	1	2	3	4	5	6	7	1	2	3	4
Head . . .	5	15	15	20	5			15	20	5	5
Prothorax . .	15	20	10	15	25	30	30				
Mesothorax . .	15	10	10	25	10	10	25	10	15	15	
Metathorax . .	15	10	15	20	25			10	15	—	
Abdomen I . .	15	20									
„ II . . .	15	20	20					10			
„ III . . .	15	20	20					10	10	15	
„ IV . . .	15	25	25					10	15	20	
„ V . . .	20	25	30					15	20	25	
„ VI . . .	25	30	30					20	25	30	
„ VII . . .	30	30	30					20	30	30	
„ VIII . . .	30	35	35					25	30	30	
„ IX . . .	35	40	k 15					25	40		
„ X . . .	30	25						45	40		

1st instar.

Sclerotisation: in dorsal aspect, head with a pair of double grey spots closely posterior to the eyes; prothorax with eight pairs of small grey spots; posterior portion of 9th abdominal segment with a broad brownish-yellow band extending from the pori to the posterior margin; posterior two-thirds of 10th abdominal segment brownish-yellow. Integumental structures: posterior margin of 9th abdominal segment beset dorsally with some 12 broadly cuneate processes each about 7μ in length. In dorsal aspect integument of prothorax beset with simple oval plaques; that from the mesothorax to 8th abdominal segment with small oval and semicircular plaques each bearing a short dark microtrichium; microtrichia upon 9th abdominal segment exceptionally long and conspicuous; in ventral aspect, integument of thoracic and 1st abdominal segments with simple oblong plaques; of 2nd to 8th abdominal segments as in dorsal aspect. Chaetotaxy: majority of lateral and some median setae upon the body divisions, in dorsal aspect, with blunt apices; those of pairs 1 and 2 upon the 9th and pair 1 upon the 10th abdominal segments knobbed. Longest setae on meso- and metathoracic coxae and upon underside of 2nd antennal joint, $20\text{--}25\mu$.

Length of setae in μ	Dorsal aspect		Ventral aspect	
Head to Abdomen VIII . . .	5-25		5-15	
Pair no.	1	2	1	2
Abdomen IX	30	45		25
„ X	40	20	35	35

Source of material : Hertfordshire, July 1932, in shoots of willow.

Thrips fuscipennis Haliday.

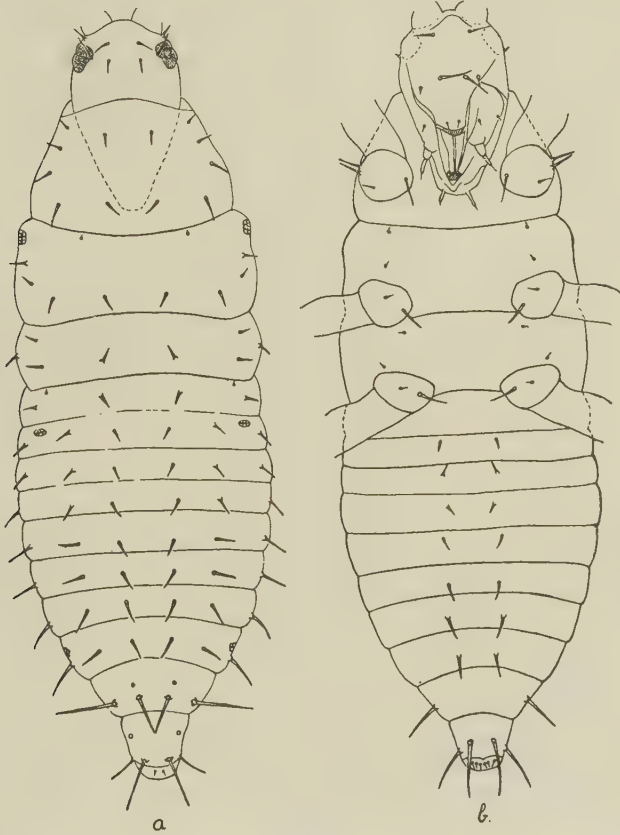
2nd instar (fig. 38; integument, figs. 48a and b).

Approximate dimensions : length 1.25 mm. Head, length 0.15 mm., breadth 0.09 mm. Antenna, length 0.15 mm. General colour : white to pale yellow. Sclerotisation : integument of body divisions unsclerotised, except apex of head sometimes with a faint urceolate grey area dorsally. Integumental structures : posterior margin of 9th abdominal segment beset dorsally and laterally with some 16 narrowly cuneate, but proximally somewhat dilated processes, each about 3 μ long. In dorsal aspect, integument of prothorax beset with simple plaques, circular in the anterior, oblong in the posterior portion; of mesothorax with oblong plaques, some with dark margins, others, in the anterior median portion, bearing a short microtrichium; of metathorax similarly, but plaques in anterior lateral portions are semicircular and each bears a microtrichium; of 1st abdominal segment anteriorly with oblong and semicircular plaques, bearing microtrichia laterally only, posteriorly with simple oblong plaques; of 2nd to 8th abdominal segments with oblong and semicircular plaques, bearing microtrichia except in the posterior portion of each; in ventral aspect, thoracic segments beset with simple oblong and oval plaques; abdominal segments as in dorsal aspect. Plaques in general prominent; upon the mesothorax dorsally the dark microtrichia are short, becoming longer (up to 5 μ) upon the more posterior abdominal segments. Spiracles : peritremes of 2nd and 8th abdominal segments of moderate size, the former about 15 μ $\times$ 10 μ , the latter 10 μ diameter. Chaetotaxy : apices of all setae acute; setae comparatively short, those upon 7th and 8th abdominal segments 30-35 μ .

Length of setae in μ	Pair no.	Dorsal aspect							Ventral aspect			
		1	2	3	4	5	6	7	1	2	3	4
Head		10	20	20	30	5			30	25	5	5
Prothorax		20	25	15	15	25	35	30				
Mesothorax		20	15	10	25	15	15	20	10	15	20	
Metathorax		20	10	15	25	25			10	15	—	
Abdomen I		15	25									
„ II		20	25	25					15			
„ III		20	25	25					15	15	15	
„ IV		20	25	25					15	15	15	
„ V		25	25	30					15	20	30	
„ VI		25	30	30					20	20	30	
„ VII		30	35	30					25	25	30	
„ VIII		30	35	35					25	25	30	
„ IX		35	45	k 20					25	40		
„ X		35	25						40	35		

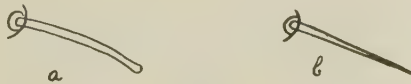
1st instar (fig. 39; antenna, fig. 2i; integument, figs. 48e and f).

Sclerotisation: integument of body divisions unsclerotised. Integumental structures: posterior margin of 9th abdominal segment beset dorsally with some 12 microtrichium-like processes, each about $5\ \mu$ in length. In dorsal aspect, integument of prothorax beset in



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FIG. 39.—*Thrips fuscipennis* Haliday. 1st instar. $\times 175$. a, dorsal aspect; b, ventral aspect.



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FIG. 40.—Median dorsal seta of 3rd abdominal segment. $\times 560$. a, *Thrips sambuci* Uzel, 2nd instar; b, *Thrips fuscipennis* Haliday, 2nd instar.

its posterior portion with simple oblong plaques; of mesothorax to 8th abdominal segment with minute semicircular plaques, each bearing a comparatively long and conspicuous

microtrichium; in ventral aspect, that of thoracic and 1st abdominal segments with simple oblong plaques; of 2nd to 8th abdominal segments as in dorsal aspect, but microtrichia less conspicuous. Chaetotaxy: apices of all setae acute. Longest setae on meso- and metathoracic coxae and upon underside of 2nd antennal joint 35 μ .

Length of setae in μ	Dorsal aspect		Ventral aspect	
Head to Abdomen VIII	10-25		5-15 ⁴	
Pair no.	1	2	1	2
Abdomen IX	30	40		25
„ X	35	20	35	35

⁴ Except head pair 1, 30 μ .

Source of material: Hertfordshire; N. Ireland, February to October, in flowers and young shoots of rose under glass. Hertfordshire, Buckinghamshire, Lancashire, May to July, on foliage of cucumber under glass. Bedfordshire, May 1939, on fruit of strawberry. Also in flowers of buttercup, dandelion, fruit trees, rose, sambucus, and many other flowering plants.

Thrips major Uzel.

2nd instar (integument, figs. 48c and d).

Approximate dimensions: length 1.0 mm. Head, length 0.17 mm., breadth 0.1 mm. Antenna, length 0.14 mm. General colour: white to pale yellow. Sclerotisation: integument of body divisions unsclerotised, except apex of head sometimes with a faint urceolate grey area dorsally. Integumental structures: posterior margin of 9th abdominal segment beset dorsally and laterally with some 20 narrowly cuneate processes 3 μ -5 μ in length, those situated laterally on each side rather longer than the remainder. In dorsal aspect, integument of prothorax beset with small oval and circular plaques, some of which, postero-laterally, bear a microtrichium; of mesothorax to 8th abdominal segment with minute semicircular plaques, each bearing a microtrichium; in ventral aspect, integument from mesothorax to 8th abdominal segment as in dorsal aspect. Spiracles and chaetotaxy as in *T. fuscipennis*.

1st instar.

Sclerotisation: integument of body divisions unsclerotised. Integumental structures: posterior margin of 9th abdominal segment beset dorsally with some 18 microtrich-like processes. Integument as in *T. fuscipennis*, but microtrichia rather shorter, and some plaques upon the ventral surface of the thoracic and 1st abdominal segments bear a microtrichium. Chaetotaxy: as in *T. fuscipennis*.

Source of material: Hertfordshire, May 1937, in flower of rose; June 1938, in flowers of sambucus; June 1932, in flowers of viburnum.

Thrips sambuci Uzel.

2nd instar (fig. 40).

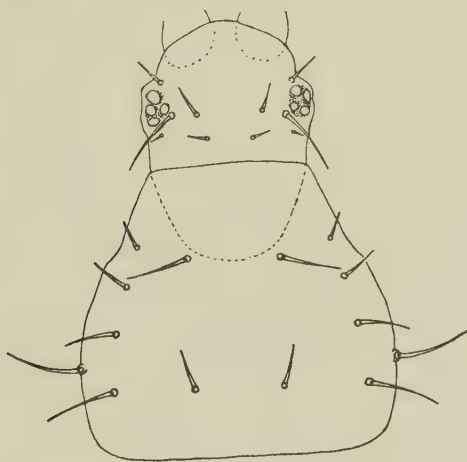
Approximate dimensions: length 1.3 mm. Head, length 0.18 mm., breadth 0.13 mm. Antenna, length 0.16 mm. General colour: white. Sclerotisation: integument unsclerotised. Integumental structures: posterior margin of 9th abdominal segment beset

dorsally and laterally with some 20 very inconspicuous processes, not exceeding $3\ \mu$ in length. In dorsal aspect, integument of thoracic and 1st abdominal segments beset with inconspicuous oblong and oval plaques, some with dark margins but devoid of microtrichia; of 2nd to 8th abdominal segments with minute semicircular plaques bearing a very short microtrichium in the anterior, and simple oval plaques in the posterior half of each; in ventral aspect, integument of prothorax beset with minute oval and semicircular plaques, some of which bear a microtrichium; of meso- and metathorax as in dorsal aspect; of first eight abdominal segments with minute semicircular plaques, each bearing a short microtrichium, except in the extreme posterior portions of each segment, where the plaques are oblong and simple. Spiracles: as in *T. fuscipennis*. Chaetotaxy: majority of setae upon dorsal surface blunt apically (fig. 40). Length of setae as in *T. fuscipennis*.

Source of material: Hertfordshire, August 1938, in flower of sambucus.

1st instar.

No material available.



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FIG. 41.—*Thrips flavus* Schrank. 2nd instar. $\times 230$. Head and prothorax, dorsal aspect.

Thrips flavus Schrank.

2nd instar (fig. 41; integument, fig. 47c).

Approximate dimensions: length 1.3 mm. Head, length 0.16 mm., breadth 0.1 mm. Antenna, length 0.18 mm. General colour: white to pale yellow. Sclerotisation: integument unsclerotised; antennal annulations indistinct. Integumental structures: posterior margin of 9th abdominal segment beset dorsally and laterally with some 24 calcariform processes, each $2\ \mu$ – $3\ \mu$ in length; those situated laterally on each side rather longer than the remainder. In dorsal aspect, integument of prothorax beset in the anterior portion with minute oval or circular plaques, in the posterior with simple oblong plaques; of meso- and metathorax with rounded plaques bearing a short microtrichium in the extreme anterior portion, and with simple oblong plaques in the remaining portion of each; of first eight abdominal segments with inconspicuous oval and semicircular plaques, bearing a short

microtrichium, in the anterior, and with simple oblong plaques in the posterior half of each segment; in ventral aspect as dorsally. Spiracles: peritremes of 2nd and 8th abdominal segments inconspicuous, each about 10 μ diameter. Chaetotaxy: apices of all setae acute. Setae upon 7th and 8th abdominal segments in dorsal, and upon 10th abdominal segment in ventral aspect moderately long.

Length of setae in μ Pair no.	Dorsal aspect							Ventral aspect			
	1	2	3	4	5	6	7	1	2	3	4
Head . . .	15	25	25	35	10			25	25	5	5
Prothorax . .	25	35	20	25	30	45	45				
Mesothorax . .	25	20	15	35	20	25	40	10	15	25	
Metathorax . .	30	20	25	30	35			10	15	—	
Abdomen I . .	25	30									
„ II . . .	30	30	30					15			
„ III . . .	30	35	35					15	15	20	
„ IV . . .	30	35	35					20	20	25	
„ V . . .	30	35	35					25	25	30	
„ VI . . .	35	40	40					25	30	35	
„ VII . . .	35	40	45					30	30	35	
„ VIII . . .	35	45	50					30	30	35	
„ IX . . .	35	55	k 15					35	50		
„ X . . .	45	25						55	55		

1st instar.

Sclerotisation: integument unsclerotised. Integumental structures: posterior margin of 9th abdominal segment beset dorsally with some 18 microtrich-like processes, not exceeding 3 μ in length. In dorsal aspect, integument of prothorax beset with small indistinct circular plaques, some of which appear to bear a short microtrichium; that of mesothorax to 8th abdominal segment with minute semicircular plaques, each bearing a short but conspicuous microtrichium; in ventral aspect, integument of thoracic and 1st abdominal segments beset with simple inconspicuous oval or oblong plaques; of 2nd to 8th abdominal segments as in dorsal aspect. Chaetotaxy: majority of setae acute apically; those upon the 9th abdominal segment in dorsal aspect with slightly knobbed apices. Longest setae on meso- and metathoracic coxae, and upon underside of 2nd antennal joint, 30–35 μ .

Length of setae in μ	Dorsal aspect		Ventral aspect	
Head to Abdomen VIII	10–25		5–15 ⁵	
Pair no.	1	2	1	2
Abdomen IX	30	45		30
„ X	35	25	40	45

⁵ Except head pair 1, 25 μ .

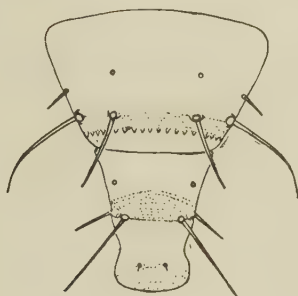
Source of material: Berkshire (Bagshot), September 1928, in flowers of gorse (*Ulex nanus*), collected by Dr. G. D. Morison.

Thrips nigropilosus Uzel.

2nd instar (fig. 42; integument, fig. 47d).

Approximate dimensions: length 1.3 mm. Head, length 0.17 mm., breadth 0.1 mm. Antenna, length 0.19 mm. General colour: white to pale yellow. Sclerotisation: pos-

terior margin of 9th abdominal segment dorsally with a yellowish-grey band extending to, but not beyond, the median seta-insertions; posterior third of 10th abdominal segment yellowish-grey. Integumental structures: posterior margin of 9th abdominal segment beset dorsally and laterally with some 20 conical processes, each $3\text{ }\mu\text{--}4\text{ }\mu$ in length. In dorsal aspect, integument of prothorax beset anteriorly with small circular and oval, posteriorly with simple oblong plaques; of meso- and metathorax with prominent simple oblong plaques; of 1st to 8th abdominal segments with oblong plaques, those in the anterior lateral portions of each of the first three, and the entire anterior portions of each



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FIG. 42.—*Thrips nigropilosus* Uzel. 2nd instar. $\times 230$. 9th–11th abdominal segments, dorsal aspect.

of the 4th to 8th segments bearing a dark microtrichium; in ventral aspect, integument of thoracic and 1st abdominal segments as in dorsal aspect; of 2nd to 8th abdominal segments beset in the anterior half of each with minute semicircular plaques, each bearing a microtrichium, in the posterior half of each with simple oblong plaques. Spiracles: peritremes of 2nd and 8th abdominal segments inconspicuous, each about $10\text{ }\mu$ diameter. Chaetotaxy: majority of dorsal setae blunt apically. Setae upon 7th and 8th abdominal segments in dorsal aspect, and upon 10th abdominal segment in ventral aspect comparatively long.

Length of setae in μ Pair no.	Dorsal aspect							Ventral aspect			
	1	2	3	4	5	6	7	1	2	3	4
Head . . .	10	35	25	35	5			30	30	5	5
Prothorax . .	35	40	25	30	35	40	45				
Mesothorax .	35	25	15	35	20	25	40	15	20	30	
Metathorax .	30	20	30	30	35			15	20	—	
Abdomen I .	25	30									
" II . . .	30	35	35					20			
" III . . .	30	35	35					20	20	25	
" IV . . .	35	35	35					20	25	35	
" V . . .	35	40	40					25	30	40	
" VI . . .	40	40	45					30	30	45	
" VII . . .	40	45	50					30	35	50	
" VIII . .	40	45	50					30	30	45	
" IX . . .	40	65	k 20					40	55		
" X . . .	50	25						65	60		

1st instar.

Sclerotisation: integument of body divisions unsclerotised. Integumental structures: posterior margin of 9th abdominal segment beset dorsally with some 14 microtrich-like

processes, each less than $3\ \mu$ in length. In dorsal aspect, integument of prothorax beset with simple minute oval plaques; of mesothorax to 8th abdominal segment with small semicircular plaques, each bearing a microtrichium; in ventral aspect, integument of thoracic and 1st abdominal segments with small simple oval plaques; of 2nd to 8th abdominal segments as in dorsal aspect. Chaetotaxy: majority of dorsal setae blunt apically; setae of pair 2 upon 9th and pair 1 upon 10th abdominal segments with finely acute apices. Setae upon 10th abdominal segment in ventral aspect long ($50\ \mu$); dorsal setae in general comparatively long. Longest setae on meso- and metathoracic coxae $20\ \mu$; upon under-side of 2nd antennal joint, $30\ \mu$.

Length of setae in μ .	Dorsal aspect		Ventral aspect	
Head to Abdomen VIII	10-35		10-20 ⁶	
Pair no.	1	2	1	2
Abdomen IX	40	50		40
„ X	45	20	50	50

⁶ Except head pair 1, $30\ \mu$.

Source of material: Scotland (Banffshire), August 1939, on *Plantago lanceolata*; collected by Dr. G. D. Morison.

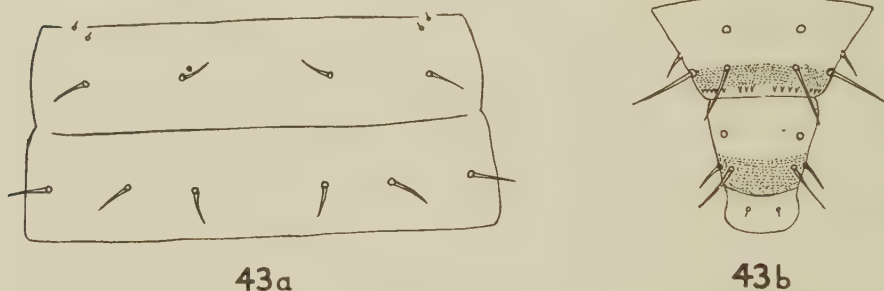


FIG. 43.—*Thrips tabaci* Lindeman. 2nd instar, dorsal aspect. $\times 230$. a, 1st and 2nd abdominal segments; b, 9th-11th abdominal segments.

Thrips tabaci Lindeman.

2nd instar (fig. 43; integument, fig. 47e).

Approximate dimensions: length 1.0 mm. Head, length 0.15 mm., breadth 0.09 mm. Antenna, length 0.15 mm. General colour: white to yellow. Sclerotisation: in dorsal aspect, head with a small urceolate grey area at apex; posterior margin of 9th abdominal segment with a light to dark grey band, extending only to the median seta-insertions; posterior third of 10th abdominal segment yellowish-grey. Integumental structures: posterior margin of 9th abdominal segment beset dorsally and laterally with some 20 broadly cuneate, apically blunt processes, not exceeding $3\ \mu$ in length. In dorsal aspect, integument of prothorax beset in the anterior portion with small circular, in the posterior portion with simple, oblong plaques; of mesothorax to 8th abdominal segment with prominent oblong plaques, the majority with dark margins and bearing a short microtrichium in the anterior portion of each segment; in ventral aspect, that of the thoracic and first

eight abdominal segments with oval plaques, each bearing a short microtrichium, except in the extreme posterior portion of each segment. Spiracles: peritremes of 2nd abdominal segment wanting; those of 8th abdominal segment small, about $7\ \mu$ diameter. Chaetotaxy: apices of all setae acute. Setae comparatively short, those upon 7th and 8th abdominal segments $30\text{--}35\ \mu$.

Length of setae in μ	Dorsal aspect							Ventral aspect				
	Pair no.	1	2	3	4	5	6	7	1	2	3	4
Head	10	15	15	20	5				20	20	5	5
Prothorax	15	20	15	15	25		30	30				
Mesothorax	15	10	10	20	15		15	20	15	15	25	
Metathorax	20	10	15	15	25				10	15		
Abdomen I	15	20										
" II	15	20	20						10			
" III	20	20	20						15	15	15	
" IV	20	25	25						15	15	20	
" V	20	25	30						15	20	25	
" VI	25	30	30						20	25	30	
" VII	30	35	35						25	30	35	
" VIII	30	35	35						25	30	35	
" IX	35	45	k 15						35	40		
" X	30	20							40	35		

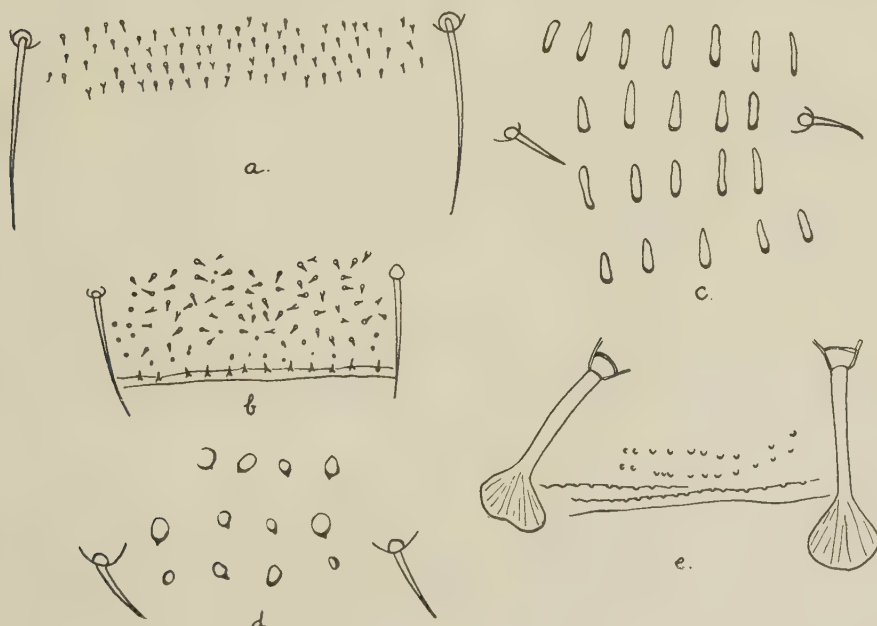
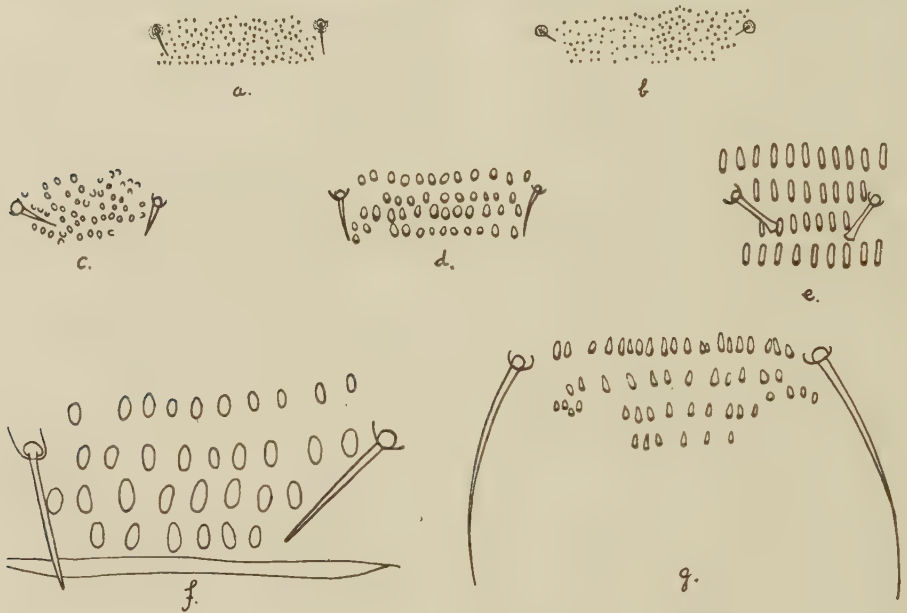


FIG. 44.—Integumental structure. $\times 560$. Portion of 3rd abdominal segment between median dorsal setae. *Aeolothrips* and *HELIOTHRIPINAE*: 2nd instar, except b, 1st instar. a, b, *Aeol. fasciatus*; c, *Hel. haemorrhoidalis*; d, *Hercin. femoralis*; e, *Parth. dracaenae*.

1st instar.

Sclerotisation: in dorsal aspect, prothorax with a pair of rounded yellowish-grey spots in the anterior portion; posterior margin of 9th abdominal segment with a grey band, extending only to the median seta-insertions; posterior third of 10th abdominal segment grey. Integumental structures: posterior margin of 9th abdominal segment beset dorsally with some 12 microtrich-like processes, not exceeding $3\ \mu$ in length. In dorsal aspect, integument of prothorax beset with simple oblong plaques; of mesothorax to 1st abdominal segment with oblong plaques, the margins of which are dark, and a few of which bear a short dark microtrichium; of 2nd to 8th abdominal segments with oblong



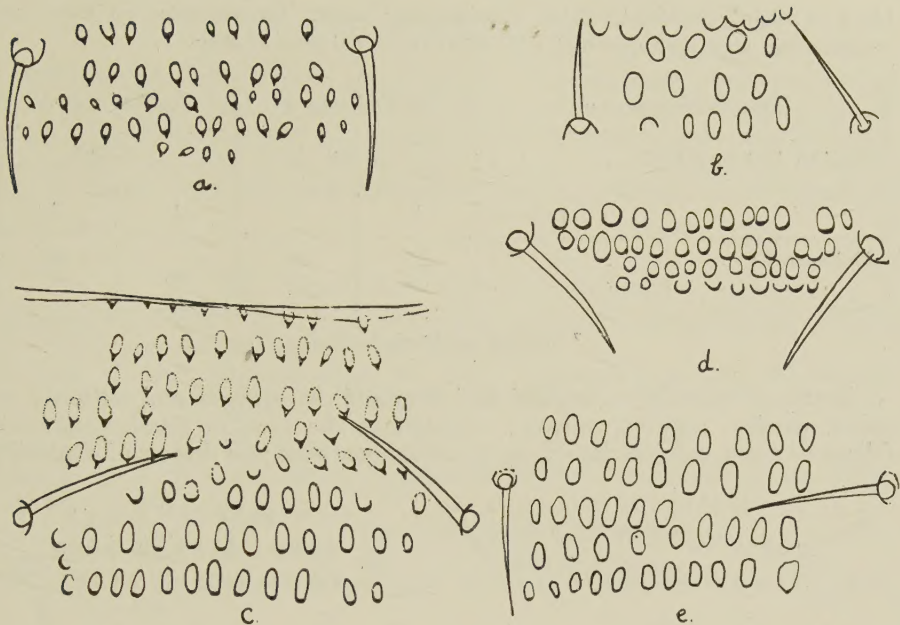
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FIG. 45.—Integumental structure. $\times 560$. Portion of 3rd abdominal segment between median dorsal setae. SERICOTHRIPINAE, CHIOTHRIPINAE, etc.: 2nd instar. a, *Scirt. longipennis*; b, *Dendr. degeeri*; c, *Lim. cerealium*; d, *Apt. rufus*; e, *Anaph. obscurus*; f, *Chaetanaphothrips* sp.; g, *Scol. sermaculatus*.

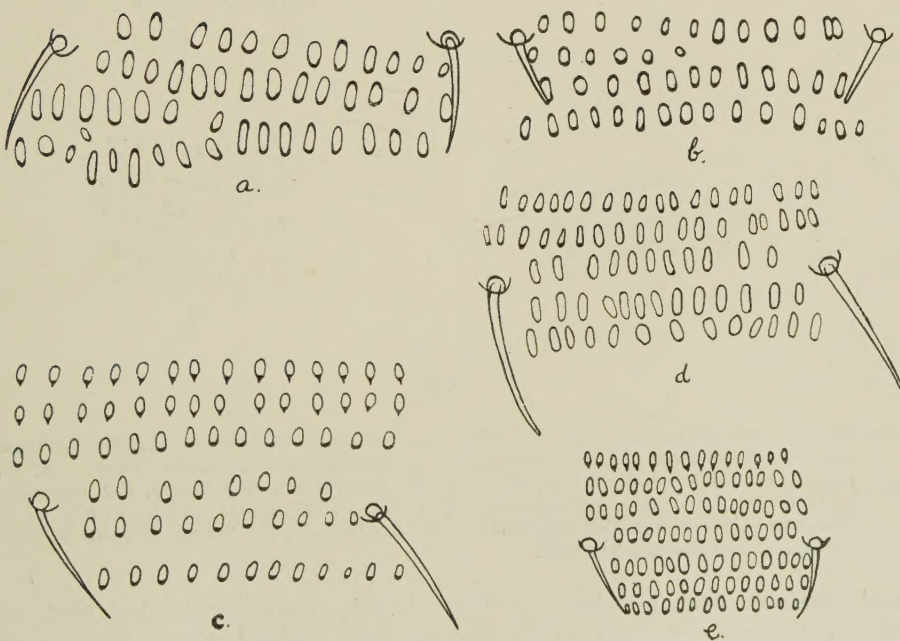
and a few oval plaques, each of which bears a short dark microtrichium; in ventral aspect, that of thoracic and 1st abdominal segments as in dorsal aspect; of 2nd to 8th abdominal segments with minute semicircular plaques, each of which bears a microtrichium. Spiracles: peritremes present upon 2nd abdominal segment, as well as upon 8th, and upon mesothorax (cf. 2nd instar). Chaetotaxy: apices of setae acute, except those of pairs 1 and 2 upon the 9th, and of pair 1 upon the 10th, abdominal segments in dorsal aspect, which are

FIG. 46.—Integumental structure. $\times 560$. Portion of 3rd abdominal segment between median dorsal setae. THRIPINAE: 2nd instar. a, *Frankl. intonsa*; b, *Kak. pisivorus*; c, *Taen. picipes*; d, *Taen. inconsequens*; e, *Thr. physapus*.

FIG. 47.—Integumental structure. $\times 560$. Portion of 3rd abdominal segment between median dorsal setae. Genus *Thrips*: 2nd instar. a, *T. validus*; b, *T. viminalis*; c, *T. flavus*; d, *T. nigropilosus*; e, *T. tabaci*.



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blunt or slightly knobbed. Setae comparatively short. Longest setae on meso- and metathoracic coxae and upon underside of 2nd antennal joint 25–30 μ .

Length of setae in μ	Dorsal aspect		Ventral aspect	
Head to Abdomen VIII	5–15		5–10 ⁷	
Pair no.	1	2	1	2
Abdomen IX	25	30		25
„ X	30	15	30	30

⁷ Except head pair 1, 25 μ .

Source of material: England and Scotland, in summer and autumn, on onion, parsley, ragwort, yarrow; throughout the year in glasshouses upon foliage of arum, calceolaria, cineraria, cucumber, bean; in flowers of carnation

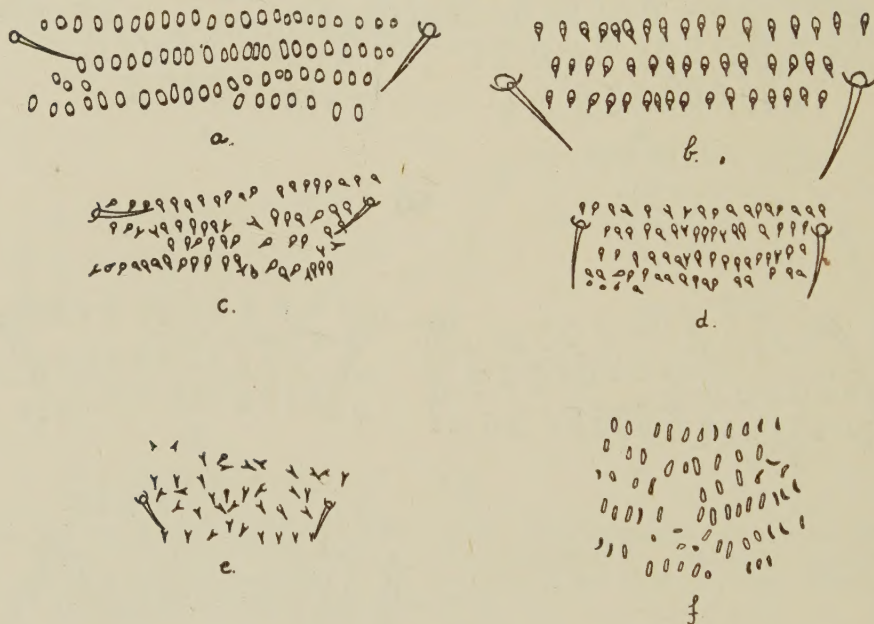


FIG. 48.—Integumental structure. $\times 560$. a–e, portion of abdominal segments between median dorsal setae; f, of mesothorax in ventral aspect. Genus *Thrips*. a, *T. fuscipennis*, 2nd instar, 1st segment; b, *T. fuscipennis*, 2nd instar, 3rd segment; c, *T. major*, 2nd instar, 1st segment; d, *T. major*, 2nd instar, 3rd segment; e, *T. fuscipennis*, 1st instar, 3rd segment; f, *T. fuscipennis*, 1st instar, anterior median portion of mesothorax (ventral).

and cyclamen, and, in winter, of rose. U.S.A. (Iowa), September 1936, on onion; collected by Prof. H. M. Harris. New Zealand (Christ Church), in flowers of carnation, collected by Mr. G. A. H. Helson (1934).

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